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FREIGHT ANALYSIS FRAMEWORK FOR MAJOR METROPOLITAN AREAS IN KANSAS

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16 Abstract

Freight transportation, through highway, rail, water and air, is critical to the Nation's economy. In 2002, $11,082,859 million worth of goods and services were transported throughout the nation. The volume of freight in the United States is expected to increase 70 percent by 2020. Therefore, there is a need for a reliable freight transportation system.

The primary objective of this research was to create a freight analysis framework for the greater Kansas City Area so that the Kansas Department of Transportation will be able to properly plan for future increases in freight traffic, identify current issues and future trends regarding freight transportation in Kansas, and ensure that the transportation infrastructure throughout the state can meet future freight transportation methods.

The objective was accomplished through a four-step approach. The first, a literature review, found common practices used to transport freight in and out of the state. Second, the research team collected data on the major commodities, industries, corridors, origins and destinations of the freight transportation industry in Kansas. The team also collected data on the weight and value of the shipments and the quantity by each mode (highway, rail, water, air). Third, the research team analyzed the data and developed the Kansas Freight Analysis Framework (KFAF), a commodity-destination database that estimates tonnage and value of goods shipped by type of commodity and mode of transportation. It also found the number of trucks passing through the Kansas City Metropolitan Area's highways. Finally, the team developed recommendations to KDOT for implementation of this framework.

The research results demonstrate that there is a need to research the accuracy of the data and if there is a more accurate data source for the Kansas City Metropolitan Area. There is a need to apply more specific assumptions to the types of trucks used. For this study, 18 wheelers were assumed to ship all commodities. However, in reality a combination of trucks were used to ship commodities in and out of Kansas City. The through truck calculations could be improved with a more accurate way of choosing in and out locations. There is a need to consider the future intermodal facilities and the new manufacturing warehouses in the projections and forecasts of truck numbers and commodity shipments. MODOT and KDOT need to work together to create a transportation plan for the Kansas City Metropolitan Area. There is a need to study the effects of the new light rail plan on future transportation issues. There is also a need to study the effects of the through truck traffic on the Kansas City highways, such as highway capacity and road conditions.

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A Report on Research Sponsored By

THE KANSAS DEPARTMENT OF TRANSPORTATION
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PREFACE

The Kansas Department of Transportation's (KDOT) Kansas Transportation Research and New-Developments (K-TRAN) Research Program funded this research project. It is an ongoing, cooperative and comprehensive research program addressing transportation needs of the state of Kansas utilizing academic and research resources from KDOT, Kansas State University and the University of Kansas. Transportation professionals in KDOT and the universities jointly develop the projects included in the research program.

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ABSTRACT

Freight transportation, through highway, rail, water and air, is critical to the Nation's economy. In 2002, $11,082,859 million worth of goods and services were transported throughout the nation. The volume of freight in the United States is expected to increase 70 percent by 2020. Therefore, there is a need for a reliable freight transportation system.

The primary objective of this research was to create a freight analysis framework for the greater Kansas City Area so that the Kansas Department of Transportation will be able to properly plan for future increases in freight traffic, identify current issues and future trends regarding freight transportation in Kansas, and ensure that the transportation infrastructure throughout the state can meet future freight transportation methods.

The objective was accomplished through a four-step approach. The first, a literature review, found common practices used to transport freight in and out of the state. Second, the research team collected data on the major commodities, industries, corridors, origins and destinations of the freight transportation industry in Kansas. The team also collected data on the weight and value of the shipments and the quantity by each mode (highway, rail, water, air). Third, the research team analyzed the data and developed the Kansas Freight Analysis Framework (KFAF), a commodity-destination database that estimates tonnage and value of goods shipped by type of commodity and mode of transportation. It also found the number of trucks passing through the Kansas City Metropolitan Area's highways. Finally, the team developed recommendations to KDOT for implementation of this framework.

The research results demonstrate that there is a need to research the accuracy of the data and if there is a more accurate data source for the Kansas City Metropolitan Area. There is a need to apply more specific assumptions to the types of trucks used. For this study, 18 wheelers were assumed to ship all commodities. However, in reality a combination of trucks were used to ship commodities in and out of Kansas City. The through truck calculations could be improved with a more accurate way of choosing in and out locations. There is a need to consider the future intermodal facilities and the new manufacturing warehouses in the projections and forecasts of truck numbers and commodity shipments. MODOT and KDOT need to work together to create a transportation plan for the Kansas City Metropolitan Area. There is a need to study the effects of the new light rail plan on future transportation issues. There is also a need to study the effects of the through truck traffic on the Kansas City highways, such as highway capacity and road conditions.

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CHAPTER ONE – EXECUTIVE SUMMARY

1.1 Introduction

Freight transportation is the backbone of the United State's economy and is critical for the daily operations of every business in the United States. Therefore, it is vital that there be a reliable freight transportation system. In order for decision makers to identify problem areas in freight transportation, the Federal Highway Administration (FHWA) created the Freight Analysis Framework (FAF). FAF is a database of major metropolitan areas and county-to-county freight flows over the national highway, railroad, water, pipeline, and air freight networks. However, the major constraint of the FAF is that it only concentrates on the major metropolitan areas of the U.S. and ignores smaller areas such as Kansas City, Wichita and Topeka, KS. This research report explains the methodology, data collection, and development of the Kansas Freight Analysis Framework (KFAF).

1.2 Research Objectives and Scope

The objective of this research is to develop a KFAF for the Kansas City Metropolitan order to identify major freight corridors and connectors, and collect data that will be important in creating a long-range freight transportation plan. The scope includes the nine-county metropolitan area of Kansas City. These counties are Cass, Clay, Jackson, Platte, and Ray in Missouri and Johnson, Leavenworth, Miami, and Wyandotte in Kansas.

1.3 Research Methodology

The methodology consists of a literature review on common practices used to transport freight. Then data was collected from the 2002 and 2007 Freight Analysis

Framework, as well as from the Kansas Department of Transportation (KDOT) and Missouri Department of Transportation (MODOT). Data collected includes freight shipments in weight and value by origin/destination, destination/origin, commodities, as well as by each mode (highway, rail, water, air, pipeline, intermodal). A summary of the data is shown in Table 1.1.

Table 1.1: Freight Shipments To, From, and Within Kansas City Metropolitan Area 2002 and 2007

	Tons (thousands)		Value (millions $)	
	2002	**2007**	**2002**	**2007**
Metropolitan Total	326,321	324,908	235,617	259,606
By Mode				
Truck	231,072	255,102	167,572	184,683
Truck & Rail	324	316	1,333	1,327
Air & Truck	29	43	1,207	1,697
Rail	34,446	38,959	26,425	27,118
Water	559	568	20	22
Other Intermodal	632	652	17,582	15,493
Pipeline & Unknown	59,260	29,267	21,479	29,267

After the data collection, the data was analyzed to create the KFAF. Lastly, conclusions and recommendations were given to help KDOT in implementing the framework.

1.4 Kansas Freight Analysis Framework Development

1.4.1 Structure

The KFAF was developed as an online database. It can be used to estimate tonnage and value of goods shipped by type of commodity and mode of transportation. There are 43 commodities ranging from live animals/ fish to furniture and even electronics. The modes include truck, truck & rail, air & truck, rail, water, other intermodal, and pipeline & unknown. The KFAF can also show the through traffic in the Kansas City Metropolitan Area.

1.4.2 Assumptions

To develop the KFAF, a few assumptions were made. When converting commodity tonnage to trucks, it is assumed that every truck is a Class 5 truck according to the FHWA Vehicle Groups. Class 5 includes Truck/Tractor Trailers with 5-axles. By using the payload by commodity, it is assumed the payloads are the same across all states.

When allocating trucks to the highways to determine through traffic, the assumption is that only the major highways are used from each direction. This is because the major highways are most likely faster than the smaller one-lane highways with lower speed limits. The following modes were classified as trucks for the KFAF: Truck, Truck and Rail, and Air and Truck. The 2007 FAF data was used to calculate the conversion of commodity tonnage to trucks and the through traffic for the KFAF.

1.4.3 Conversion of Commodity Tonnage to Trucks

The number of trucks was computed by converting the number of tons of freight into pounds and dividing it by the Class 5 average payload of each commodity from the FHWA Vehicle Class VIUS. The definition of Trucks used for conversion included the modes Truck, Air & Truck, Truck & Rail, all from the 2007 FAF data. An example of the conversion is shown in Figure 1.1.

$$\frac{\text{\# of Tons X 1000 tons X 2000lbs/1 ton}}{\text{commodity payload}} = \textbf{Number of Trucks}$$

Example for Live Animals and Fish

$$\frac{3 \text{ X } 1000 \text{ x } 2000/1}{41{,}627} = 144 \text{ trucks}$$

Figure 1.1: Formula for Converting Commodity Tonnage to Trucks

The total number of trucks with a destination of Kansas City metropolitan area was 5,648,558 in 2007. While, the total number of trucks with an origin of Kansas City metropolitan area was slightly higher with 5,697,096 trucks in 2007.

1.4.4 Allocation of Trucks to Highways

Trucks were allocated to the major Kansas City highways including I-70, I-35, I-29 and 71 based on the direction the trucks are going to and from Kansas City. Some of the states were split between two directions; therefore, half of the trucks were used for each direction. The highway distributions to Kansas City from the North, South, East and West are shown in Tables 1.2-1.5. The distributions from Kansas City are shown in Tables 1.6-1.9.

Table 1.2: Highway Distributions To Kansas City Metropolitan Area from the North

Highway Distributions To Kansas City From The North Using I-29 & I-35 South	
Locations	**Number of Trucks**
Alaska	23
Canada	17,248
Idaho ½	851
Illinois ½	61,227
Iowa	98,457
Minnesota	19,765
Montana	1,167
Nebraska	43,254
North Dakota	1,078
Oregon ½	693
South Dakota	4,384
Washington ½	1,244
Wisconsin	15,608
Wyoming ½	1,464
Total	266,462

Table 1.3: Highway Distributions To Kansas City Metropolitan Area from the East

Highway Distributions To Kansas City From The East Using I-70 West	
Locations	**Number of Trucks**
Alabama	13,019
Connecticut	953
District of Columbia	47
Delaware	876
Florida	6,597
Illinois ½	61,227
Georgia	13,161
Indiana	45,414
Kentucky	26,251
Maine	6,397
Massachusetts	1,091
Maryland	3,255
Michigan	48,915
Mississippi ½	3,470
Missouri	2,159,633
North Carolina	11,048
New Hampshire	1,665
New Jersey	5,906
New York	29,245
Ohio	52,418
Pennsylvania	19,674
Rhode Island	2,650
South Carolina	6,872
Tennessee	20,108
Virginia	5,420
Vermont	852
West Virginia	548
Asia & Europe 1/2	7,123
Total	2,553,836

Table 1.4: Highway Distributions To Kansas City Metropolitan Area from the South

Highway Distributions To Kansas City From The South Using I-35 and 71 North	
Locations	**Number of Trucks**
Arizona	797
Arkansas	77,784
Kansas ½	1,283,994
Louisiana	24,757
Mexico	6,288
Mississippi ½	3,470
New Mexico	2,091
Oklahoma	57,226
Texas	79,503
Americas	7,349
Total	**1,503,259**

Table 1.5: Highway Distributions To Kansas City Metropolitan Area from the West

Highway Distributions To Kansas City From The West Using I-70 East	
Locations	**Number of Trucks**
California	19,087
Colorado	48,544
Hawaii	0
Idaho ½	851
Kansas ½	1,243,994
Oregon ½	693
Utah	1,141
Nevada	284
Washington ½	1,244
Wyoming ½	1,464
Asia and Europe ½	7,123
Total	**1,324,425**

Table 1.6: Highway Distributions From Kansas City Metropolitan Area to the North

Highway Distributions From Kansas City To The North Using I-29 & I-35 North	
Locations	**Number of Trucks**
Alaska	193
Canada	23,702
Idaho ½	821
Illinois ½	36,459
Iowa	78,810
Minnesota	24,133
Montana	1,629
Nebraska	104,338
North Dakota	442
Oregon 1/2	1,510
South Dakota	9,677
Washington ½	1,314
Wisconsin	14,314
Wyoming ½	2,324
Total	**299,666**

Table 1.7: Highway Distributions From Kansas City Metropolitan Area to the East

Highway Distributions From Kansas City to the East Using I-70 East	
Locations	**Number of Trucks**
Alabama	34,082
Connecticut	1,753
DC	351
Delaware	310
Florida	16,485
Illinois ½	36,459
Georgia	15,067
Indiana	31,760
Kentucky	9,068
Maine	964
Massachusetts	2,096
Maryland	4,040
Michigan	9,534
Mississippi ½	7,310
Missouri	2,347,495
North Carolina	19,139
New Hampshire	3,430
New Jersey	7,059
New York	5,145
Ohio	18,114
Pennsylvania	13,223
Rhode island	595
South Carolina	2,595
Tennessee	24,738
Virginia	4,451
Vermont	57
West Virginia	5,220
Asia & Europe ½	6,547
Total	**2,627,088**

Table 1.8: Highway Distributions From Kansas City Metropolitan Area to the South

Highway Distributions From Kansas City to the South Using I-35 and 71 South	
Locations	**Number of Trucks**
Arizona	8,205
Arkansas	147,328
Kansas ½	1,121,290
Louisiana	14,821
Mexico	8,657
Mississippi ½	7,310
New Mexico	2,861
Oklahoma	99,248
Texas	133,690
Americas	4,600
Total	**1,548,009**

Table 1.9: Highway Distributions From Kansas City Metropolitan Area to the West

Highway Distributions From Kansas City to the West using I-70 West	
Locations	**Number of Trucks**
California	32,848
Colorado	35,471
Hawaii	0
Idaho ½	821
Kansas ½.	1,121,290
Oregon ½	1,510
Utah	13,466
Nevada	1,953
Washington ½	1,314
Wyoming ½	2,324
Asia and Europe ½	6,547
Total	**1,217,543**

The total number of trucks allocated from each direction is summarized in Tables 1.10 and 1.11.

Table 1.10: Highway Distributions From Kansas City Metropolitan Area

Highway Distributions From Kansas City	
From Kansas City to the East using I-70 East	2,627,088
From Kansas City to the North Using I-29 & I-35 North	299,666
From Kansas City to the South Using I-35 & 71 South	1,548,009
From Kansas City to the West Using I-70 West	1,217,545

Table 1.11: Highway Distributions To Kansas City Metropolitan Area

Highway Distributions to Kansas City	
To Kansas City From the East Using I-70 West	2,553,836
To Kansas City From the North Using I-29 & I-35 South	266,462
To Kansas City From the South Using I-35 & 71 North	1,503,259
To Kansas City From the West Using I-70 East	1,324,425

1.4.5 Through Trucks

The through traffic is calculated by adding the number of trucks into Kansas City and the number of trucks out of Kansas City then subtracting this number from the truck counts given by KDOT and MODOT. The total through traffic is found to be 23,158,050 trucks. Table 1.12 shows the calculated through traffic per year along with the highway distributions of trucks to and from Kansas City Metropolitan Area.

Table 1.12: Kansas City Metropolitan Area Through Traffic Per Year

Intersection	Trucks From LDOT/ MODOT	Trucks to and from Kansas City	Through Traffic Per Year
	A	B	C
I-70E Before K-7 (West of KCK)	10,475,500	2,541,971	7,933,529
I-35N at Miami County Line	12,373,865	3,051,268	9,322,597
I-29S at Platte County Line & I-35S at Clay County Line (North of KC)	6,440,425	566,128	5,874,297
I-70W at Jackson County & Lafayette County Border (East of KC)	5,208,550	1,180,924	27,626
Total	34,498,340	11,340,290	23,158,050

1.4.6 Projections

Two projections/ forecasts methods were developed. One method allows a user to enter a percentage increase and another utilizes the 2002 and 2007 FAF data. In the first method, the KFAF user is able to enter a percent increase or decrease for all commodities or select different percentages for up to four commodities. Then, commodity, mode, or truck traffic views are shown in a single table. In the second method, the 2002 and 2007 FAF data is used to find an average increase for one year. Then the years 2011, 2013 and 2018 are forecasted.

1.5 Conclusions and Recommendations

The purpose of this section is to state the conclusions and recommendations that the researchers have determined based on the literature review, data collection, and KFAF Development.

1.5.1 Conclusions

Based on the results of this project, the following conclusions are made:

1. In 2007, the top 5 commodities shipped to the Kansas City Metropolitan Area by weight include cereal grains, gravel, nonmetal mineral products, waste/scrap and unknown goods.
2. In 2007, the top 5 commodities shipped from the Kansas City Metropolitan Area by weight include cereal grains, gravel, nonmetal mineral products, waste/scrap and other agricultural products.
3. In 2007, the top 5 commodities shipped to the Kansas City Metropolitan Area by value include machinery, mixed freight, motorized vehicles, pharmaceuticals, and electronics.

4. In 2007, the top 5 commodities shipped from the Kansas City Metropolitan Area by value include machinery, mixed freight, motorized vehicles, pharmaceuticals, and textiles/leather.
5. The KFAF is a web-accessible, commodity-destination database that allows registered users to quickly view collected data from past years along with estimations of future shipments to and from the greater Kansas City Metropolitan Area. Currently, it contains data from the 2002 and 2007 versions of the Freight Analysis Framework, which can be found online at http://ops.fhwa.dot.gov/freight/freight_analysis/faf/index.htm.
6. The KFAF can be used by KDOT planners when making decisions for maintaining an adequate infrastructure in Kansas.
7. The framework of the KFAF can be used to develop a freight analysis model for other cities in the State of Kansas once reliable data becomes available.

1.5.2 Recommendations

The results of this research also lead the researchers to certain recommendations in order to improve the KFAF. Based on the results of this research project, the following recommendations are made:

1. There is a need to improve the accuracy of the data and determine if a more accurate data source could be developed for the Kansas City Area.
2. There is a need to apply more specific assumptions to the types of trucks used. 18 wheelers were assumed to ship all commodities in this study. However, in reality a combination of trucks were used to ship commodities in and out of Kansas City.

3. The through truck calculations could be improved with a more accurate way of choosing in and out locations.
4. There is a need to consider the future intermodal facilities and the new manufacturing warehouses in the projections and forecasts of truck numbers and commodity shipments.
5. MODOT and KDOT need to work together to provide a transportation plan for the Kansas City Metropolitan Area.
6. There is a need to study the effects of the new light rail plan on future transportation issues.
7. There is a need to study the impact of the through truck traffic on the Kansas City highways, such as highway capacity, road conditions, and maintenance costs.

CHAPTER TWO – INTRODUCTION

2.1 Problem Statement

Freight transportation is the backbone of the United State's economy and is critical for the daily operations of every business in the United States. In 2002, $11,082,859 million worth of goods and services were transported throughout the nation. The volume of freight in the United States is expected to increase 70 percent by 2020 (Johnson and Sedor, 56). According to Daniel Murray, director of research for the American Transportation Research Institute, "the ability to plan trips, deliveries, and transactions down to hours and minutes – rather than days and weeks" is the key to succeeding in the freight industry. "This makes reliability one of the single most important performance measures from a private sector perspective."

Therefore, it is vital that there be a reliable freight transportation system. In order for decision makers to identify problem areas in freight transportation, the Federal Highway Administration (FHWA) created the Freight Analysis Framework (FAF). FAF is a database of major metropolitan areas and county-to-county freight flows over the national highway, railroad, water, pipeline, and air freight networks. However, the major constraint of the FAF is that it only concentrates on the major metropolitan areas of the U.S. and ignores smaller, areas such as Kansas City, Wichita and Topeka, KS.

2.2 Research Objectives and Scope

The objective of this research is to develop a Kansas Freight Analysis Framework (KFAF) for metropolitan areas in Kansas in order to identify major freight corridors and connectors, and collect data that will be important in creating a long-range freight transportation plan for metropolitan areas in Kansas. The scope includes the

nine-county metropolitan area of Kansas City. These counties are Cass, Clay, Jackson, Platte, and Ray in Missouri and Johnson, Leavenworth, Miami, and Wyandotte in Kansas.

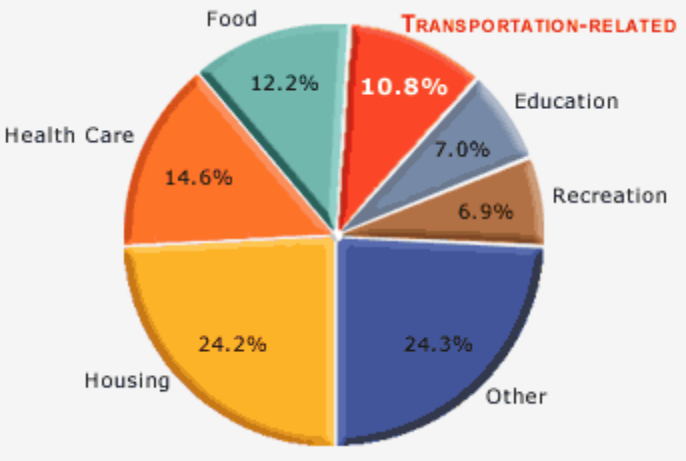
2.3 Research Methodology

The research methodology is a four-step approach. The first, a literature review found common practices used to transport freight in and out of the state. Second, the research team collected data on the major commodities, industries, corridors, origins and destinations of the freight transportation industry in Kansas. The team also collected data on the weight and value of the shipments and the quantity by each mode (highway, rail, water, air, pipeline). Third, the research team analyzed the data and developed the Kansas Freight Analysis Framework (KFAF), a commodity-destination database that estimates tonnage and value of goods shipped by type of commodity and mode of transportation. Finally, the team determined if the framework reasonably represented the flow of freight transportation in Kansas and developed recommendations to KDOT for implementation of this framework.

CHAPTER 3 – LITERATURE REVIEW

3.1 History of Freight Transportation

The United States transportation system is important to the health of the economy. The system provides people and businesses access to goods, materials, services, markets, jobs, recreation and other people. Transportation makes up 11 percent of the Nation's gross domestic product, approximately $950 billion, and accounts for 19 percent of spending by America's average household (National Atlas, 2007). See Figure 3.1. The American transportation system carries 3.7 trillion ton miles of domestic freight and 4.7 trillion passenger miles of travel (National Atlas, 2007).



Source: U.S. Department of Transportation, Bureau of Transportation Statistics, Pocket Guide to Transportation, February 2002

Figure 3.1: Transportation's Importance to the Gross Domestic Product: 2000

Freight transportation also provides jobs to millions of people, which contributes to the economic growth. Transportation related industries, such as vehicle manufacturing, parts suppliers and for-hire services, employed more than 10 million people in 2000 (Sedor et al, 2002). Seventy percent of the transportation workers were truck drivers (USDOT BTS 2002b).

3.2 Problems in Today's Freight Transportation

According to America's Freight Challenge, America's new barrier to trade is the tariff of congestion in the 21st Century. "This congestion increases travel times, it disrupts tightly planned supply chains, and it raises the costs of doing business with America and in America. The effect of rising congestion is like a tax- only it escalates every year without a vote of the people. The congestion tax can be repealed only if the United States adopts a new vision and new strategy for a global, 21st Century American transportation system."

The cause of the congestion crisis is stemmed from the aging transportation modes or network that serves the United States. There are three types of modes of transportation based on the environment. These include water, land, and air (Rodrique et al, 2006). Water transportation consists of maritime transportation, land consists of highway, railroad and pipeline, and air consists of aviation. Currently, highway is the most highly used mode of freight transportation followed by railroad.

"The Bureau of Labor Statistics reports that productivity for the intercity trucking, railroad, air transport, and petroleum pipeline industries has improved over the last 20 years" (Sedor et al, 2002). However, the railroad industry followed by the pipeline industry made the most productivity improvements.

America's water ports receive a large amount of foreign trade which is overpowering their capacity. Foreign trade will likely double nationally and triple at major ports within the next 20 years (AASHTO, 2007). The water ports and inland ports struggle to handle the current freight volumes, as well as, future volumes.

United State's Highway System consists of four million miles of streets and roads and 600,000 bridges (National Atlas, 2007). The interstate system "accounts for only 1 percent of all highway mileage but carries 25 percent of the total vehicle miles of travel (National Atlas, 2007). The highway system was originally planned in the 1950s for traffic of the 1980s. Today, highways have a lot of congestion which leads to loss in productivity and costs with cargo delays. Also "overcrowded highways act as an 'inefficiency tax,' seriously constraining economic growth" (AAR, 2007c) by approximately $100 billion per year (Lowe, 1994).

America's Railroad Network was planned in the 19th Century during the industrial era, playing a vital role in the development of North America (Rodrigue et al, 2006). Railroads offered improved travel time and reliable schedules for the movement of freight. Today, freight railroads continue to be an important element in the United States economy. They move over 40 percent of the nation's freight (in ton-miles) and connect businesses and markets all over the world (AAR, 2007b). The United States operates over 120,000 miles of railroad tracks as of 2006 (AAR, 2007a), however, 90 percent of U.S. freight railroads are privately owned and operated (AAR, 2007b). Through wages, taxes, purchases and benefits, railroads contribute billions of dollars each year to the economy. More railroads will be needed in the coming years to meet the needs of the nation's transportation system, including the booming ports, intermodal and logistics sites, and the manufacturing and agricultural industries.

America's Air Transportation began with Wright Brothers flying the Kitty Hawk in 1903. Not until 1914 was there the first scheduled flight from Tampa to St. Petersburg, Florida. Commercial air transportation began with airmail in America (Bilstein, 1983 in

Rodrigue et al, 2006). “There are over 19,000 airports in the United States, with approximately 540 serving commercial operations, and over 5,000 coastal, Great Lakes and inland waterway facilities moving cargo” (Sedor et al, 2002). Anchorage, Alaska is a main freighter hub for routes between Europe and Asia. Some airlines carry both cargo and passengers such as Northwest Airlines. FedEx is the top freight airline and the world’s second most profitable airline behind Singapore Airlines with almost $5,000 million during 1994 and 2004 (Rodrigue et al, 2006).

Another serious problem is the importance of improving connections between modes. Most trade requires the use of two modes, also known as intermodal, whether it be from truck to rail, water to truck, air to truck, etc. The connections for today’s trades are inadequate in keeping up with such a fast paced, time-driven society. This congested network is keeping the United States from competing with international traders. The value of foreign trade is important to the United States economy and the GDP is expected to increase from 13 to 25 percent from 1990 to 2020 (AASHTO, 2007).

To face the unending crisis, the United States must improve the transportation system and create a new vision allowing the U.S to compete with the global economy. Therefore, the Freight Analysis Framework is the first step towards this goal.

3.3 Federal Freight Analysis Framework

The Freight Analysis Framework project began in 1999 by the Federal Highway Administration (FHWA) Office of Freight Management and Operations. It was intended to be used as an analytical tool for the internal FHWA. Freight Office staff and private-sector consultants worked together to create the FAF over a four year span. The FAF development cost approximately $5 million, including the private consultants’ services in

developing freight flow maps, analytical methods, FAF data sets as well as the purchase of forecasts and data.

The project is the first comprehensive database of transportation flows on the Nation's infrastructure. The FAF examines four main transportation modes, including highway, railroad, water, and air. Using these modes, a comprehensive database was developed.

More specifically, "the Freight Analysis Framework integrates data from a variety of sources to estimate commodity flows and related freight transportation activity among states, regions, and major international gateways. The original version, FAF^1, provides estimates for 1998 and forecasts for 2010 and 2020. The new version, FAF^2, provides estimates for 2002 and the most recent year plus forecasts through 2035" (FHWA, 2007). Also, during this study the 2007 data was published.

In other words, the FAF does two things:

1. Estimates tonnage and dollar amount commodities from one place to another.
2. Helps to answer the number of trucks carrying those goods and determines congestion level on highways.

"Although, the FAF was originally envisioned as an analytical tool for internal Federal Highway Administration use, presentations by members of the FAF team stimulated outside interest, and use of the FAF has spread beyond the agency. In October 2002, a press release from the Secretary of Transportation announced the release of the FAF, stating that 'by using this tool, state and local government and the private sector can determine which transportation corridors are or will become heavily

congested in the future and better plan solutions to help alleviate these bottlenecks in the intermodal transportation network.' As part of the FAF outreach effort, the Freight Office mailed 1,300 FAF CDs to mid-level managers and planners interested in freight issues" (Meyburg, 2004).

According to the Freight Analysis Framework: Issues and Plans, the basic information in FAF is "essential for understanding key trends and issues such as:

- growth in freight transportation activity throughout the United States, and the pressures created by that growth on the Nation's transportation systems;
- patterns of merchandise trade with domestic and international partners and the economic growth potential associated with that trade;
- volumes of traffic passing through a location between distant origins and destinations, indicating the effects of external traffic on local transportation facilities and the importance of local facilities to distant places;
- markets served by different modes of transportation and intermodal combinations;
- locations exposed to risks of hazardous materials incidents and other safety aspects of freight transportation;
- energy use and environmental consequences of freight transportation;
- efficiency and productivity of logistical systems supporting the Nation's economy; and
- likely impacts of transportation policies on efficiency, economic productivity, safety" (FHWA, 2004).

The remainder of this chapter focuses on the methods and tools used to create the second version of the Freight Analysis Framework, as well as, other state freight research and Kansas City freight history.

3.4 FAF Methods

The FAF project involved three major technical steps: development of the physical FAF network, development of domestic and international freight flows, and linking them to the physical FAF network and development of forecasts for 2010 and 2020 (for FAF[1]) or 2035 (for FAF[2]). The FAF road network draws on state-specific databases and data from federal road inventories that contain, or can be linked to, Highway Performance Monitoring System (HPMS) data.

Highway Performance Monitoring System (HPMS) *is a national level highway information system that includes data on the extent, condition, performance, use, and operation characteristics of the Nation's highways.*

According to Tianjia Tang with the Federal Highway Administration the flow process of constructing the Freight Analysis Framework consists of the following ideas (T. Tang, personal communication, Oct. 12, 2007):

- What freight?
- Figure out freight classification.
- How do you measure? Dollar value and weight (tonnage)
- What mode? Truck (highway), rail, air, water
- How many trucks do you need to transport goods?
- How much does each truck carry? – figure out vehicle carrying capacity
- Which highway? Which route do you take?
- How many lanes does the highway have?

- How much congestion?
- How do the trucks impact the roads?

3.4.1 FAF Physical Network

The FAF physical network consists of

- 114 Commodity Flow Survey (CFS) regions
- 17 additional international gateways (AIG)
- 7 International trade regions

The commodity flow survey regions are shown in Figure 3.2. A list of geographic zones can be found in Table A2.

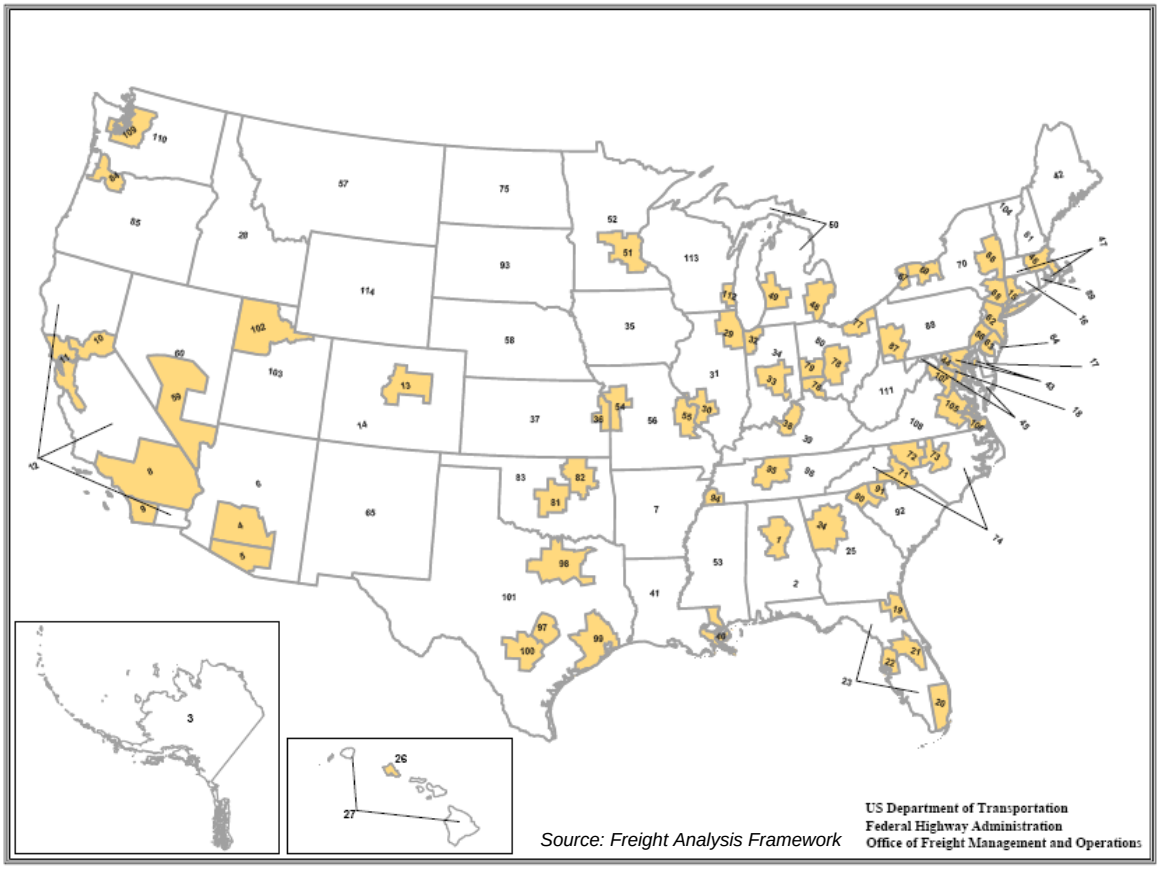
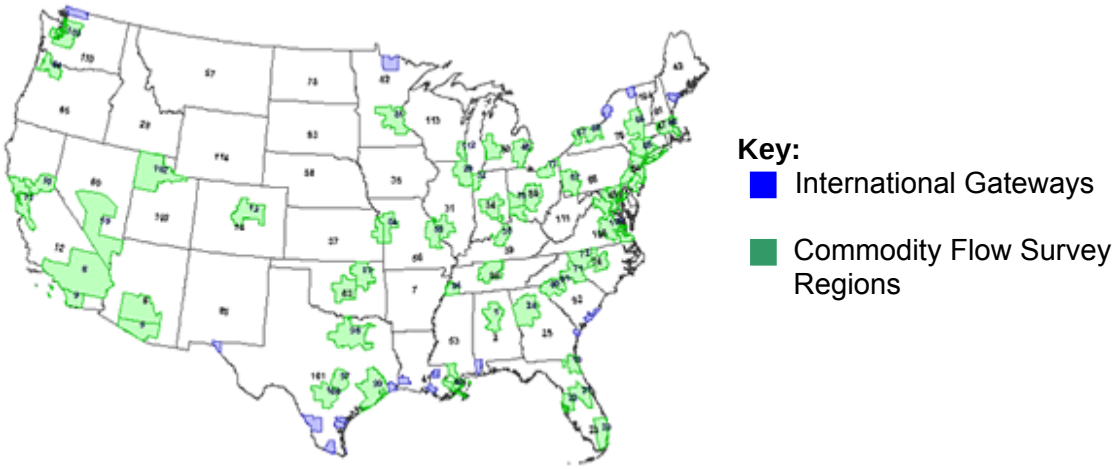


Figure 3.2: Geographic Areas from the FAF and 2002 Commodity Flow Survey

The international gateways include land crossings in Laredo, TX, Blaine, WA, International Falls, MN, Champlain/Rouses Point, NY, Alexandria Bay, NY; El Paso, TX, Brownsville/Hidalgo,TX, ports in Beaumont, TX, Charleston, SC, Portland, ME, Savannah, GA, Morgan City, LA, Corpus Christi, TX, Lake Charles, LA, Baton Rouge, LA, Mobile, AL, and an airport in Anchorage, AK. These gateways are shown in Figure 3.3.



Source: Freight Analysis Framework

Figure 3.3: Map of FAF Physical Network

The seven international trade regions include:

1. Canada
2. Mexico
3. Latin and South America
4. Asia
5. Europe
6. Middle East
7. Rest of the World

3.4.2 FAF Classification Systems

The Freight Analysis Framework requires a classification for distinguishing types of commodities in the United States. “The system must: (1) be tied to the industries which create and ship goods; (2) identify major commodities carried by each mode of transportation and each significant intermodal combination; and (3) be linked to classifications used for international trade” (FHWA, 2006b). FAF[1] used the Standard Transportation Commodity Code (STCC) to analyze the railroad industry, while FAF[2] uses Standard Classification of Transported Goods (SCTG). The following classification systems are used or referred to in the FAF to differentiate goods:

- *Standard Classification of Transported Goods (SCTG)* employs a five-digit numbering system, the structure of which is hierarchical. The hierarchy has four levels, each of which follows two important principles. First, each level covers the universe of transported goods. Second, the commodities in a given classification of a given level are mutually exclusive of those in any other classification of that level. At the two-digit level there are 42 commodities plus one unknown. It was

developed in the 1990s by the statistics agencies in U.S. and Canada to detail commodities not carried by rail. It replaced the STCC system in 1997. Table 3.1 gives the SCTG Classifications and Table A1 shows First Level (2-digit) SCTG Definitions.

Table 3.1: SCTG Classifications

Level of Classifications in SCTG		
Level of Hierarchy	**Number of Categories**	**Information Provided**
First Level, 2-digits	42	Analytical overview
Second Level, 3-digits	133	U.S. Canadian product groups
Third Level, 4-digits	283	Transportation characteristics
Fourth Level, 5-digits	504	CFS 2002 collection level

**Categories as defined for 2002 CFS*
Source: Report 4: FAF Commodity Classification

- *Standard Transportation Commodity Code (STCC)* was developed by the Association of American Railroads initially in the 1960s as a comprehensive commodity classification system. The STCC structure is hierarchical, allowing collapsible data. The levels range from two to five digits. The first four digits of the STCC number represent the industry that produced the commodity. The fifth number gives the product classes within the producing industries. The last two digits give commodity detail for the railroads. FAF[1] flows were reported at the 2-digit commodity level but were estimated at the 4-digit level.
- *Harmonized System (HS)* is a six digit commodity classification system used worldwide for international trade.
- *Standard International Trade Classification (SITC)* is a six digit statistical classification system for commodities entering external trade.
- *Standard Industry Classification (SIC)* is a numerical code scheme previously used for classifying industries and products. In January 1997 the SIC was

replaced by the North American Industry Classification System (NAICS) (2002 Economic Census, 2002).

- *North American Industry Classification System (NAICS*) is an industry classification system used by statistical agencies to facilitate the collection, tabulation, presentation, and analysis of data relating to establishments. NAICS is erected on a production-oriented conceptual framework that groups establishments into industries according to similarity in the process used to produce goods or services. Under NAICS, an establishment is classified to one industry based on its primary activity. NAICS was developed jointly by Canada, Mexico, and the United States to provide comparability in economic statistics. It replaced the Standard Industrial Classification (SIC) system in 1997 (2002 Economic Census, 2002).

The FHWA used public and private data sets including the 1993 Commodity Flow Survey (CFS) for FAF[1], the 2002 Commodity Flow Survey for FAF[2], and the Reebie Associates' proprietary Transearch data set. Because of data gaps, some of the FAF freight flows were synthesized by using models. DRI-WEFA, Inc. (now Global Insight, Inc.) created the future projections for 2010, 2020 and 2035. Information is displayed using either Microsoft Access or CVS (Comma-Delimited) database formats. Maps are also displayed using GIS.

3.4.3 FAF Capacity Analysis

A national highway capacity analysis was constructed through four steps:

1. Establishment of freight analysis network
2. Establishment of freight analysis zones (FAZs)
3. Freight demand analysis
4. Capacity-related performance measures.

The capacity-related performance measures were forecasted for years 2010 and 2020 (for FAF[1]) which included:

- Traffic Volume
- Design Hour Volume
- Capacity
- v/c (volume:capacity) ratios
- Travel Times
- Delay

The FAF Highway Capacity Analysis Methodology Report details the calculations.

3.4.4 FAF Forecasting Methodology

According to the report Methodology for the Freight Analysis Framework-2: Forecasts of Inter-regional Commodity Flows, the forecasting process involves two important steps. The first is constructing the geography in the Business Demographics Model and the Business Transactions Matrix relative to the 2002 FAF[2] base year data. The creation of the FAF[2] region geography in these two models is a collection process,

grouping the county-level data into the FAF^2 regional market definitions, and summing the values.

The second step involves combining the North American Industry Classification System (NAICS) industry sector classifications and the two-digit level of the Standard Classification of Transported Goods (SCTG) commodity classification. This combination was achieved through extensive review of existing commodity classification files that detail the relationships between various codes. Finding a combination between NAICS and SCTG is important because it "provides the bridge between the value and weight of the physical commodities and products shipped through the transportation system and the industry activity measured by economists on an industry establishment level, typically using the value of output or purchases and the associated employment" (Global Insight Inc., 2007).

General steps to calculating the 2002 commodity base tonnage forecasts include: “

1. Establish national control totals by commodity;
2. Apply specific shipment growth by market and commodity;
3. Apply specific purchasing and consumption growth by market and commodity;
4. Summarize & compare the results from steps 2 & 3 with the national controls;
5. Adjust the resulting freight flows so that the volumes correspond with the national control levels as follows:

Global Insight's Business Demographics Model (BDM) contains a consistent set of historical statistical estimates and forecasts by industry sector, by geographic region. The statistics include the number of business establishments, employees, and sales by industry. Industry aggregation levels include the sub-sectors and the 4-, 5-, and 6-digit classifications in the NAICs codes. The model specifically forecasts variables at the county level. Other geographic levels are created by combining, aggregating, or splitting data from this level.

- For each market and commodity, adjust so shipments match purchases.
- For each commodity, adjust so that national control totals are satisfied” (Global Insight Inc., 2007).

The following sections give an overview of how freight volume forecasts, measuring both tonnages and dollar values, for both the domestic and international segments of the FAF^2 data sets were created.

3.4.4.1 Domestic Forecast Methodology

According to the report Methodology for the Freight Analysis Framework-2: Forecasts of Inter-regional Commodity Flows, the first step to domestic forecasting is to take the county-level employment and the U.S. dollar value of output information from the Global Insight's Business Demographics Model (BDM), by NAICS code. Then the

employment data is converted into SCTG categories and then into the 2-digit SCTG level.

The original 2002 baseline FAF[2] domestic freight flow data set is then created into two versions. The first version contains all the original modal information and its freight tonnage and dollar volume values. The second version, while maintaining tonnage and volume values, combines each mode volumes into region-to-region traffic lane totals.

3.4.4.2 International Forecast Methodology

The international forecast methodology is similar to that of the domestic. However, certain adjustments had to be made for "different underlying growth drivers for international business transactions and the additional gateway or port market definitional dimensions that are incorporated" (Global Insight Inc., 2007).

3.4.5 FAF Database

A FAF Database was set up in order to allow federal government users to access freight flow information at the county-to-county level. However, because of the private nature of some the data sets, publicly available data from the FAF are only available up to the state-to-state level. The FAF database contains freight flow databases, highway freight truck movement databases and flow networks, waterway shipment databases and rail freight shipment databases.

3.5 FAF Effectiveness

According to a workshop held in Washington, D.C. in October of 2003, "the committee found that the FAF and accompanying maps of freight flows have been effective in raising awareness of freight issues among policy makers at the highest

levels within USDOT, state departments of transportation (DOTs), and the U.S. Congress. The FAF has also demonstrated clearly the potential value of combining data from different sources to create a national multimodal freight database and linking this database to economic forecasts" (Meyburg, 2004).

3.6 Other State Freight Research

For each state, FHWA has summaries of freight shipments to, from, and within that state. The tables include 2002 and 2035 shipments by value and weight, top commodities and top trading partners. Maps and commodity flows are also included.

Technically, there are no other state FAFs for FAF is a FHWA project. However, other state research is being pursued on similar projects like the one described in this report for the Kansas City Metropolitan area. Other states seem to be experiencing the same problems in regards to freight transportation in all modes. The pursuance of an intermodal facility is not a new idea as well. The following section describes other states research and initiatives in improving freight transportation.

3.6.1 North Dakota

The Upper Great Plains Transportation Institute and North Dakota State University in Fargo, North Dakota conducted several strategic freight analyses for the North Dakota Transportation Department in June 2005. In regards to the North Dakota Strategic Freight Study on Motor Carrier Issues, "the study found that motor carriers may encounter different conditions that impede travel as they strive to move freight. Congestion, load restrictions (seasonal or other), construction, speed limits, non-controlled highway access, bridge restrictions, height and width restrictions and enforcement activity all impede the seamless movement of freight. Case studies were

developed in the report that provide insight as to how speed limits and traffic signals influence travel time as well as costs associated with delays for trucks and automobiles. NDDOT is striving to mitigate impediments that interfere with the free flow of goods by promoting efficiency in the motor carrier industry that potentially save businesses time and money" (NDSU, 2005).

In another analysis, The Role of Intermodal Container Transportation in North Dakota a survey was conducted and the following are the findings: "(1) modal shares for outbound products were 53 percent by truck, 45 percent by rail, and 2 percent by container, (2) modal shares for inbound raw materials were 98 percent by truck and the rest by rail, (3) in responding to a question asking why firms use the transportation modes they use, more than half reported timely and reliable service as one reason, 46 percent reported direct access as a reason, and 40 percent reported low rates - this may suggest that an intermodal option that combines timely service with lower rates in comparison to truck transport may be desirable for shippers in the region, (4) a large amount of the freight volume from the surveyed regions is located in the southeast portion of North Dakota and northwest Minnesota, and (5) of the firms that use intermodal container transportation as an option, 9 percent reported having been denied service within the last year" (Berwick, 2002).

3.6.2 Ohio

In 2001, the Ohio Department of Transportation also conducted a study, Freight Impacts on the Ohio's Roadway System, with the help of Cambridge Systematics and Reebie Associates. This was due to the obvious growth in volume of freight, the correlation between truck ADT and maintenance needs and the importance to Ohio's

economic health. “The research study found that the Origin-Destination tonnage information could be converted to daily trucks and mapped to Ohio’s roadways. The resulting assigned freight truck volumes agreed with the pattern of observed truck counts and screenlines. The methods used, county-to-county assignments and all-or-nothing assignments, produced flows that are accurate for corridors, not for individual facilities” (ODOT, 2002).

3.7 Freight Transportation in Kansas City Metropolitan Area

Freight transportation in Kansas began with the railroads in 1866 with the Union Pacific, Eastern Division opening between Topeka and Leavenworth. In 1872, a western route opened between Atchison, Topeka, and Sante Fe (KSHS, 2007). A route reaching Denver, Colorado area opened in 1870. Union Pacific, Eastern Division’s name was changed to Kansas Pacific in 1868. However, due to financial difficulty, it merged with its competitor, Union Pacific, in 1880. For the Kansas Pacific, the most profitable good in the 1860s and 1870s was the transporting of cattle from Texas to cities in Kansas, such as Abilene and Ellsworth.

The Leavenworth, Lawrence and Galveston railroad was created in 1864, building a line from Lawrence to the Gulf of Mexico. The Atchison, Topeka and Santa Fe railroad took it over in 1882. The Missouri, Kansas and Texas (MKT), also known as Katy, branched out from Union Pacific, Southern Division. It was the first railroad to reach the southern border of Kansas. The Missouri Pacific line began in 1865 in Kansas City; it later bought the Kansas City, Wyandotte and Northwestern railroad in 1885. In the late 19th Century, freight hauling was one of the most important services of the railroads, carrying perishable goods and heavy items in and out of Kansas (KSHS,

2007). Most of the heavy freight that was hauled into or out of Kansas after 1870 was carried by rail.

In 1993, $71 billion of goods weighing 135 million tons were shipped from Kansas, according to the Commodity Flow Survey. This was 1% of the weight and value of total U.S. shipments. “The most important commodity shipped from Kansas by value was food or kindred products” (USDOT, 1996).

“Local transportation of freight is important to Kansas’s commerce. The distribution of commodities by domestic destination and distance of shipments reflects the importance of local transport. The CFS shows that in 1993, about 25 percent of the value and 54 percent of the weight of total shipments from Kansas were shipped to destinations within the state” (USDOT, 1996).

In 1993, 75% of the value and 46% of the weight of all shipments from Kansas went to other states such as Missouri, Texas and Oklahoma. According to CFS, most commodities were moved by trucks. Rail moved 9% of the value and 21% of the weight. Eight percent of the value of all Kansas shipments was moved by U.S. postal and courier services.

In 1994, the five largest commodities shipped by rail that originated in Kansas include farm products, coal, food products, chemicals, and mixed freight. The largest was farm products with 11,630,991 tons and 36% of the state total. The top five commodities shipped by rail with Kansas as the destination included coal, farm products, chemicals, nonmetallic minerals and mixed freight. The largest commodity was coal with 16,553,775 and 60% of the state total (USDOT, 1996).

Kansas did not ship or receive foreign goods through a water mode in 1994. However, they did ship 291 tons and receive 101 tons of freight through water. Waterborne shipments originating in Kansas in 1994 went to destinations such as Indiana, Louisana, Missouri and Tennessee. The largest amount was shipped to Missouri. Most of commodities originating in Kansas but shipped waterborne were unknown products. 35.5% were food and food products (USDOT, 1996).

According to Bureau of Transportation Statistics Special Report in May 2007, Kansas shipped $5,058 million worth of NAFTA shipments in all modes during 2005. These NAFTA shipments increased in 2006 to $6143 million.

3.7.1 Railroad

Kansas City is the nation's second largest rail center, trailing Chicago. Four of the Seven Class I rail carriers serve the Kansas City area as well as one local switching carrier. The major lines include:

- Union Pacific Railroad/Southern Pacific Lines (UP)
- Kansas City Southern Railway (KCS)
- Burlington Northern Santa Fe Railroad (BNSF)
- Norfolk Southern Corporation Railway Company (NS)

All of these railroads are part owners of the Kansas City Terminal Railway. It operates 86.83 miles of track within the Kansas City region. (See Figure A1 for rail lines map). The Kansas City Terminal Railway Company is a Class III railroad that originated in 1906 and coordinated main line and switching tracks for the 12 original Kansas City railroads in Union Station. The company continues these responsibilities for the major railroads in Kansas City, Missouri and Kansas City, KS. However, in 1994 BNSF

Railway took over responsibility of maintenance and in 2006, KCT became the Kansas City Transportation Company. This new company operates the switching tracks. There are currently 87 miles operated by the KCT with 25 miles in Kansas and 62 miles in Missouri.

Union Pacific Railroad/Southern Pacific Lines (UP) is the largest railroad in North America with 32,400 miles of track (Miller, et al., 2006). The Union Pacific owns 2,248 miles of track in Kansas and "operates a transcontinental corridor through the northeastern corner of the state with as many as 60 trains per day between Topeka and Kansas City" (Miller et al., 2006). The railroad also operates tracks from Kansas City south to the Gulf Coast.

Kansas City Southern Railway's (KCS) headquarters is in Kansas City, MO. The railroad consists of over 6,400 miles in the Central and Southeastern United States and Mexico (Miller et al., 2006). It currently has 18 miles of track in Kansas.

Burlington Northern Santa Fe Railroad (BNSF) is a combination of the railroads Burlington Northern and Santa Fe, which merged in 1996. The railroad operates 1,237 miles of track and 443 miles of trackage rights. The Kansas Division of BNSF is headquartered in Kansas City, KS.

Norfolk Southern Corporation Railway Company (NS) currently operates three miles of track in the Kansas City area (Miller et al., 2006).

3.7.1.1 Other Railroads

Other Railroads in Kansas City include the Missouri and Northern Arkansas Railroad and the Gateway Western Railway (GWWR). The Missouri and Northern Arkansas Railroad is a Class III short-line railroad that operates 384.1 miles from

Kansas City, Missouri to Newport, Arkansas as well as 34 miles of trackage rights on Union Pacific Railroad lines (MNA, 2008). The Gateway Western Railway (GWWR) was a Class II Railroad that operated 408 miles between Kansas City and St. Louis, MO. In 1997, Kansas City Southern bought GWWR. Then in 2002, GWWR merged with KCS and took over control.

3.7.2 Intermodal

There are six truck/rail intermodal facilities serving seven rail carriers and Triple Crown, a joint venture of Conrail and Norfolk Southern. In 2000, Kansas City Southern Railroad leased the Kansas City South Airport (formerly the Richards-Gebaur Air Force Base) to convert to an intermodal facility.

3.7.2.1 Norfolk Southern/ Triple Crown Intermodal Facility

Norfolk Southern opened its intermodal terminal in Kansas City in 1994. The 100-acre site next to an interstate highway also has storage space for 300 trailers and 264 stacked containers. Norfolk Southern also uses the site to unload automobiles and as a terminal for Triple Crown Service, the railroad's joint venture with Conrail to use RoadRailers, hybrid rail cars/truck trailers.

3.7.2.2 BNSF Argentine Intermodal Facility

The BNSF Argentine Intermodal Facility sits on a 45 acre site (See Figure A2 for Argentine Facility Layout). It is the second fastest growing intermodal facility with 371,529 lifts in 2007 and a 17% increase overall. Currently, there is no room for expansion or for customer co-location. Therefore, there is a plan to build a new facility in Gardner, Kansas. The location of Argentine in relation to the Gardner facility is shown in Figure 3.4.

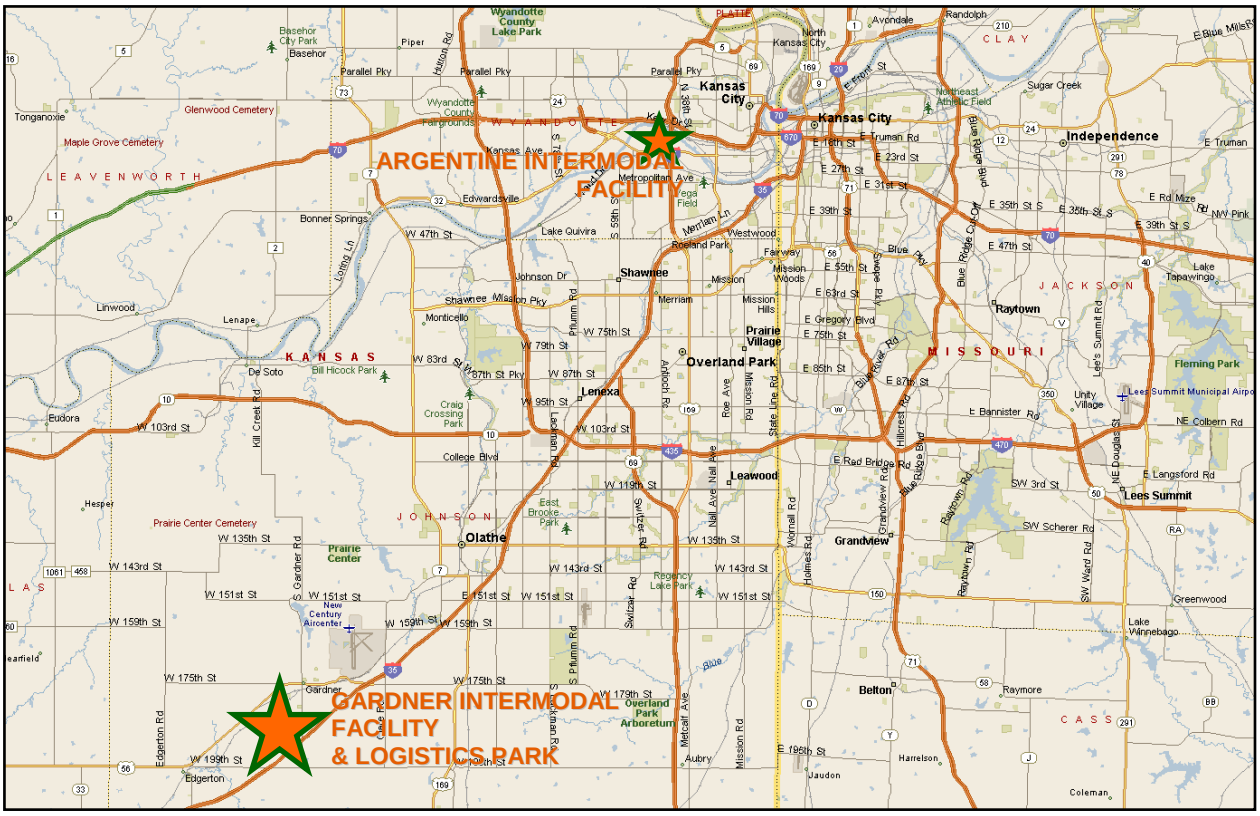


Figure 3.4: Kansas City Intermodal Facility Locations

3.7.2.3 Gardner Intermodal Facility and Logistics Park

Gardner was chosen as the spot for a new intermodal facility because it is 25 miles from the KC metroplex, adjacent to BNSF Mainline, near interstate 35 and the available land for facility and economic development. The design of the facility includes eight 8,000' strip tracks under wide-span cranes, associated stacking area, and two 8,000' strip tracks with conventional cranes for trailers (See Figure A3). It will have an initial capacity of 650,000 lifts which is scalable to 1.5 million lifts.

BNSF plans to open the 1000 acre park in 2009. It will be located at 191st and Waverly along 56 highway. The moving line will be through the park next to the mainline and the warehouse will be developed on adjacent land. There will also be a conservation corridor (See Figure A4).

The City of Gardner created an Intermodal Review Committee who presented a report to the Gardner City Council and Planning Commission. The results of this report include the benefits, concerns and recommendations for the facility (See Tables A3, A4, A5). The facility will also have a traffic impact. Therefore, BNSF and KDOT performed a Break-In Access study completed in October of 2007, which indicated the need for a new interchange somewhere between 199th and Homestead along I-35.

3.7.2.4 CenterPoint - KCS Intermodal Center

Another intermodal facility, the CenterPoint - KCS Intermodal Center, is set to open in March 2008. Located at the former Richards-Gebaur Memorial Airport, the 1,100 acre facility will be an 'International Freight Gateway' distribution center serving Kansas City Southern Railway and Mexican ports (KC Smartport, 2008). Three hundred forty acres will make up the railroad's intermodal facility and 970 acres will be an industrial park that could offer 5 million to 7 million square feet of storage space (Heaster, 2008). The site will also be designated as Foreign Trade Zone. CenterPoint Properties, a Chicago-base industrial development company, bought parts of the site from KC Port Authority for $10.6 million. In January 2008, KCS will begin shifting their intermodal operations from their current facility in the East Bottoms to the new site. The current tenant is Mazda North America. Figure 3.5 shows the KCS system map.

Source: KCS Website

Figure 3.5: Kansas City Southern System Map

3.7.2.5 Northland Park

Northland Park is a 2,200 intermodal facility for Norfolk Southern Railroad. It is located near Highway 210 and N. Kimball Dr. in Kansas City, MO. The current tenants include WW Grainger, Watkins, Motor Lines, and TNT Logistics. The Norfolk Southern routes serve the Midwest and Eastern areas of the United States and are shown in Figure 3.6.

Source: Norfolk Southern Railroad

Figure 3.6: Norfolk Southern Intermodal System Map

3.7.2.6 Kansas City Intermodal Business Center

The logistics site at Kansas City International Airport, named the Kansas City Intermodal Business Center is 800 acres (See Figure A5 for KCI Intermodal Site Plan). Its projected industrial real estate impact is 17.8 million (KC Smartport, 2008). KCI's current All-Cargo Airline Tenants include BAX Global, DHL, FedEx, Kitty Hawk, and UPS.

3.7.2.7 New Century Air Center

The New Century Air Center logistics park is 2500 acres located at 175th Street and Interstate 35 in Southwest Kansas City. At this location air, rail and highway meet. The site contains a 7300 ft main runway, a 5000 ft crosswind runway, a Federal Aviation Administration (FAA) contract air traffic control tower, Category I instrument landing system, and a fire station with Aviation and Rescue Fire Fighting (ARFF) capability (KC Smartport, 2008).

According to Bob Perry, Director of Aviation and Administration for the Johnson County Airport Commission, there is no freight moved through either New Century AirCenter or the Olathe/Johnson County Executive Airport, by air. These are both general aviation reliever airports and serve private and corporate aircraft. They do, however, have a rail network that serves several tenants in our New Century business park. BNSF is the servicing rail provider that drops off and picks up cars for the tenants. In 2005, 3,225 carloads entered the New Century business park (Miller, 2006).

Also, many of the business park tenants have significant truck traffic to deliver raw materials and distribute goods produced. Over four hundred acres are leased to

over 35 industrial and commercial tenants in the fields of printing, avionics, telecommunications and food processing.

3.7.3 Trucking

Kansas City is one of the top five trucking centers in the United States and has become a hub within the trucking industry. Yellow Freight is one of the largest trucking firms in the nation and is located in the Kansas City region. There are over 100 trucking companies located in our region.

3.7.4 Air Freight

There are three airports that are capable of supporting large air cargo aircraft. These include:

- Kansas City International Airport (KCI)
- Kansas City Downtown Airport
- Johnson County New Century Air Center (formerly Johnson County Industrial Airport)

Of these, KCI is the only airport that currently has air cargo service. It is located near the north end of Runway IL/19R and capable of handling the world's largest cargo aircraft. It is a twenty-four hour customs center.

In 2000, KCI handled a total of 332 million pounds of airfreight cargo and 301 million pounds in 2003. KCI ranks as the highest volume cargo airport the six-state region of Missouri, Kansas, Iowa, Nebraska, Oklahoma and Arkansas.

The Johnson County New Century Air Center as described in section 2.7.2.7 is planning a new runway and is situated to become an intermodal center of transport with its on-site rail infrastructure and warehousing capabilities. Transporting freight through

the several Kansas City general aviation airports is expensive and inefficient compared to the other main airports. New Century is open 7 days a week and provides two full-service fixed base operators on the field. These operators provide fuel lubrication and flight line services for all classes of reciprocating and turbine craft. The airport also offers other services including air charter, aircraft maintenance, aircraft sales and flight training.

3.7.5 Water

Kansas City can transfer freight on barges through the Missouri River. Thirty seven docks/terminal sites are along the river between Leavenworth, Kansas and Missouri City, Missouri. Most of these sites are owned by private businesses. The U.S. Army Corps of Engineers manages the shipping channel along the Missouri River from St. Louis to Sioux City, Iowa. Grains, fertilizer, cement, coal, coke, petroleum, sand and gravel, chemicals and scrap metal are the typical commodities shipped along the Missouri River.

CHAPTER 4 – DATA COLLECTION

4.1 Collection Process

Data was collected from the 2002 and 2007 Freight Analysis Framework, as well as from the Kansas Department of Transportation (KDOT) and Missouri Department of Transportation (MODOT). Data collected includes freight shipments in weight and value by origin/destination, destination/origin, commodities, as well as by each mode (highway, rail, water, air).

4.1.1 2002 Freight Analysis Framework

FAF2 Version 2.1 (FAF2.1) - Released in January 2006. Version 2.1 covers commodity origin destination data for base year 2002. FAF2 Version 2.2 (FAF2.2) - Released in November 2006. Version 2.2 replaces Version 2.1. It covers commodity origin destination data including base year 2002 and future years from 2010 to 2035 with a five-year interval. Version 2.2 includes minor corrections to 2002 base year flows in Version 2.1.

The 2002 FAF2 is derived from three categories of data: Commodity Flow Survey (CFS) Within-Scope Data, Auxiliary Data, and CFS Out-of-Scope Data. Data includes freight shipments in weight and value by origin/destination, destination/origin, commodities, as well as by each mode (highway, rail, water, air). The CFS covers business establishments in mining, manufacturing, wholesale trade, and selected retail industries. It is a survey that covers selected auxiliary establishments (e.g.,warehouses) of in-scope multiunit and retail companies. The survey coverage excludes establishments classified as farms, forestry, fisheries, governments, construction, transportation, foreign establishments, services, and most establishments in retail. The

industries covered are defined in the 1987 Standard Industrial Classification Manual (SIC). (See 3.4.2 FAF Classification Systems for more information on SIC). Also the complete version of the 2002 FAF data can be downloaded from the Freight Analysis Framework website at http://ops.fhwa.dot.gov/freight/freight_analysis/faf/index.htm.

In 2002, the Kansas City Metropolitan Area shipped $146,317 million worth of commodities. A summary of shipments by value and by commodity originating from KC is shown in Tables A9 and A10, respectively.

4.1.2 2007 Freight Analysis Framework

"The FAF is based primarily on data collected every five years as part of the Economic Census. Recognizing that goods movement shifts significantly during the years between each Economic Census, the Federal Highway Administration produces a provisional estimate of goods movement by origin, destination, and mode for the most recent calendar year. These provisional data are extracted and processed from yearly, quarterly, and monthly publicly available publications for the current year or past years and are less complete and detailed than data used for the 2002 base estimate" (FHWA, 2007). More information on the 2007 Commodity Origin-Destination database can be found on the FAF website at:

http://ops.fhwa.dot.gov/freight/freight_analysis/faf/faf2provisional_2006/report/index.htm.

In 2007, the Kansas City Metropolitan Area shipped $88,598 million worth of commodities. The top commodity was cereal grains with 35,485 ktons originating in Kansas City and 33,950 ktons with a destination of Kansas City. The top commodities by value are mixed freight and machinery. In 2007, $14,342 mdol of mixed freight

originated in Kansas City while $11,648 mdol of machinery had a destination of Kansas City. Also the complete version of the 2007 FAF database can be downloaded from the Freight Analysis Framework website at:

http://ops.fhwa.dot.gov/freight/freight_analysis/faf/index.htm.

4.1.3 2002 and 2007 FAF Terms and Definitions

Modes of Transportation

Truck: Includes private and for-hire truck. Private trucks are operated by a temporary or permanent employee of an establishment or the buyer/receiver of the shipment. For-hire trucks carry freight for a fee collected from the shipper, recipient of the shipment, or an arranger of the transportation.

Rail: Any common carrier or private railroad.

Water: Includes shallow draft, deep draft and Great Lakes shipments. FAF2 uses definitions by the U.S. Army Corps of Engineers. Shallow draft includes barges, ships, or ferries operating primarily on rivers and canals; in harbors; the Saint Lawrence Seaway; the Intra-coastal Waterway; the Inside Passage to Alaska; major bays and inlets; or in the ocean close to the shoreline. Deep draft includes barges, ships, or ferries operating primarily in the open ocean.

Air (includes truck-air): Includes shipments by air or a combination of truck and air. Commercial or private aircraft, and all air service for shipments that typically weigh more than 100 pounds. Includes air freight and air express.

Truck-Rail Intermodal: Includes shipments by a combination of truck and rail.

Other Data Definitions

Commodity: Based on the definition used by the 2002 CFS, commodities are products that an establishment produces, sells, or distributes. This does not include items that are considered as excess or byproducts of the establishment's operation. Survey respondents reported the description and the five-digit Standard Classification of Transported Goods (SCTG) code for the major commodity contained in the shipment, defined as the commodity with the greatest weight in the total shipment.

Shipment: A shipment is a single movement of goods, commodities, or products from an establishment to a single customer or to another establishment owned or operated by the same company as the originating establishment (e.g., a warehouse, distribution center, or retail or wholesale outlet). Full or partial truckloads are counted as a single shipment only if all commodities on the truck are destined for the same location. If a truck makes multiple deliveries on a route, then each stop is counted as one shipment.

Standard Classification of Transported Goods (SCTG): The commodities shown in this report are classified using the SCTG coding system. The SCTG coding system was developed jointly by agencies of the United States and Canadian governments based on the Harmonized Commodity Description and Coding System (Harmonized System) to address statistical needs in regard to products transported. More information on SCTG is available at http://www.statcan.ca/english/Subjects/Standard/sctg/sctg-class.htm#19.

Tons shipped: The total weight of all shipments transported between any pair of FAF regions or within a FAF region during the course of a calendar year. Tons, in the FAF, are stated as short tons (2,000 pounds). For freight shipped to distribution centers

for subsequent reshipment, the tonnage is counted each time the goods are transported. As with value of shipments, the tonnage of a product could be counted multiple times depending on the number of times the product is transported in the production and consumption cycle. Thus, tons shipped can be, and frequently are, multiples of the estimated tons of a commodity as measured for the purposes of the Gross Domestic Product (GDP).

Value of commodities transported. The net selling value, f.o.b. (free on board) plant, exclusive of freight charges and excise taxes. The value data are displayed in millions of 2002 U.S. dollars.

The total value of shipments, as measured by the 2002 CFS, and hence by the FAF, and the U.S. GDP provide different measures of economic activity in the United States and are not directly comparable. GDP is the value of all goods produced and services performed by labor and capital located in the United States. In 2002, the U.S. GDP was estimated at $10.4 trillion (measured in current U.S. dollars). The value of shipments, as measured by ORNL, is the market value of goods shipped from manufacturing, mining, wholesale, and mail-order retail establishments, as well as warehouses and managing offices of multi-unit establishments. This is estimated to be $13 trillion in 2002.

Three important differences can be identified between GDP and value of shipments:

- GDP United States. FAF measures goods shipped from a subset of all goods-producing establishments.

- GDP measures the value of goods produced and of services performed. FAF measures the value of goods shipped.
- GDP counts only the value-added at each step in the production of a product. FAF captures the value of shipments of materials used to produce or manufacture a product, as well as the value of shipments of the finished product itself. This means that the value of the materials used to produce a particular product can contribute multiple times to the value. (FHWA, 2006b)

4.1.4 Data from KDOT

The Kansas Department of Transportation (KDOT) has truck data for the major highways in Kansas City, Kansas, shown in Figures A6 and A7 and Kansas City, Missouri shown in Figure A8.

4.1.5 Data from MODOT

The Missouri Department of Transportation (MODOT) has a geodatabase that can be used in GIS, and it includes all total commercial truck volumes each direction for 2006, with calculated or actual collected quantities. The geodatabase includes the following highways/routes: I-435, I-635, I-670, US 24, US 40, US 69, I-70, I-35, I-29, Rte. 71, Rte. 210 Rte. 50, Rte 169, Rte. 291 & Rte. 92.

4.2 Major Products and Commodities

In 2002, the top 5 commodities shipped to the Kansas City Metropolitan Area by weight include coal – n.e.c. (coal and petroleum products, not elsewhere classified), cereal grains, gravel, coal, and nonmetal mineral products. The top 5 commodities shipped to the Kansas City Metropolitan Area by value include machinery, motorized

vehicles, coal – n.e.c., mixed freight, and pharmaceuticals. Table 4.1 shows the value and weight of the top commodities shipped to the KC Metropolitan Area.

Table 4.1: Top 5 Commodities Shipped To KC Metro by Truck: 2002

Commodity	Tons (Thousands)	Commodity	Value (Million $)
	2002		2002
Coal-n.e.c.	33.234	Machinery	12,537
Cereal grains	29, 395	Motorized vehicles	12,267
Gravel	17,106	Coal-n.e.c.	10,736
Coal	14,640	Mixed freight	9,541
Nonmetal min. products	8,401	Pharmaceuticals	7,320

*Includes shipments by Truck, Truck & Rail, and Air & Truck

Cereal grains, coal – n.e.c., gravel, nonmetal mineral products, and waste/scrap are the top 5 commodities shipped from the Kansas City Metropolitan Area by weight in 2002. The top commodities shipped from the Kansas City Metropolitan Area by value include motorized vehicles, mixed freight, machinery, coal – n.e.c., and miscellaneous manufacturing products. Table 4.2 shows the value and weight of the top commodities shipped from the KC Metropolitan Area.

Table 4.2: Top 5 Commodities Shipped From KC Metro by Truck: 2002

Commodity	Tons (Thousands)	Commodity	Value (Million $)
	2002		2002
Cereal grains	40,601	Motorized vehicles	21,818
Coal n.e.c.	25,493	Mixed freight	14,834
Gravel	15,572	Machinery	8,598
Nonmetal min. products	9,550	Coal-n.e.c.	7,836
Waste/ scrap	9,202	Misc. mfg. prods.	6,982

*Includes shipments by Truck, Truck & Rail, and Air & Truck

Tables A6, A7, A8 and A9 contain the data shipped by all trucks and are listed by commodity from the 2002 FAF.

By weight, the major products and commodities shipped to the Kansas City Metropolitan Area in 2007 include cereal grains, gravel, nonmetal mineral products, waste/scrap and unknown. However, the top commodities by value differ greatly from those by weight. Table 4.3 lists the top 5 commodities by weight and value shipped to Kansas City for 2007.

Table 4.3: Top 5 Commodities Shipped To KC Metro by Truck: 2007

Commodity	Tons (Thousands)	Commodity	Value (Million $)
	2007		2007
Cereal grains	27,653	Machinery	13,146
Gravel	19,394	Mixed freight	9,871
Nonmetal min. prods.	8,958	Motorized vehicles	8,483
Waste/ scrap	7,609	Pharmaceuticals	5,962
Unknown	4,954	Electronics	4,730

*Includes shipments by Truck, Truck & Rail, and Air & Truck

In 2007, the top 5 commodities shipped from the Kansas City Metropolitan Area by weight include cereal grains, gravel, nonmetal mineral products, waste/crap, and other agricultural products. The top 5 commodities shipped from Kansas City Metropolitan Area by value include machinery, mixed freight, motorized vehicles, pharmaceuticals, and textile leather. Table 4.4 shows the value and weight of these top commodities shipped from Kansas City in 2007.

Table 4.4: Top 5 Commodities Shipped From KC Metro by Truck: 2007

Commodity	Tons (Thousands)	Commodity	Value (Million $)
	2007		2007
Cereal grains	35,485	Machinery	11,648
Gravel	17,917	Mixed freight	7,496
Nonmetal min. prods.	10,367	Motorized vehicles	5,404
Waste/scrap	7,283	Pharmaceuticals	4,777
Other Ag. Prods.	4,473	Textiles/leather	4,553

**Includes shipments by Truck, Truck & Rail, and Air & Truck*

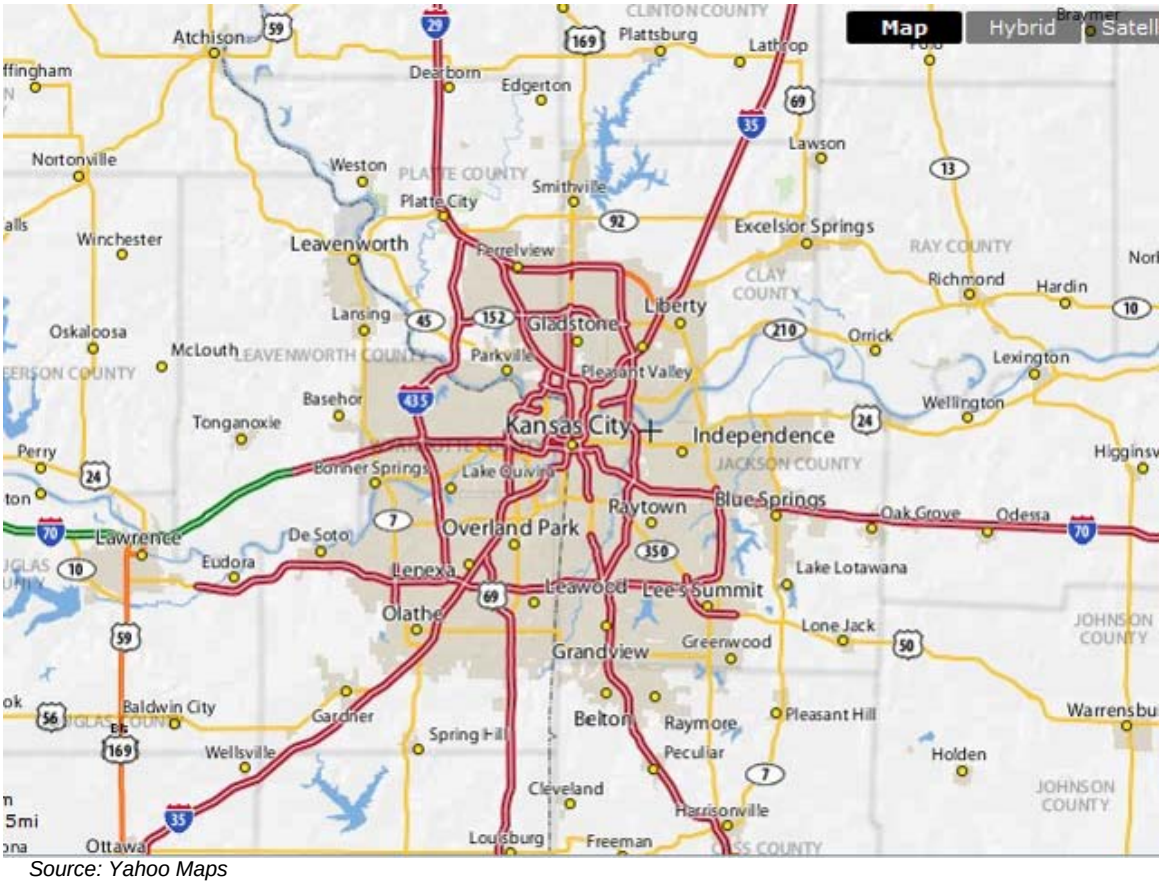
See Tables A10, A11, A12 and A13 for all the commodities, their values, and their weight for 2007.

4.3 Major Corridors and Routes

The major highways, routes and corridors in the Kansas City Metropolitan Area include the following:

-I-70	-I-35
-I-29	-I-635
-Highway 71	-Highway 50
-152	-291
-69	-169
-K-10	-K-7
-I-470	-32
-350	-40
-24	-50

Figure 4.1: The major highways, routes and corridors in KC.



Source: Yahoo Maps

Figure 4.2: Major Highways, Routes and Corridors in Kansas City Metropolitan Area

This study focused on just a few of these highways. They included Interstate 35, Interstate 435, Interstate 71, and Interstate 29.

4.4 Origins and Destinations

The origins and destinations include major metropolitan areas in the United States and foreign trade regions. Table A2 shows the metropolitan areas and foreign trade regions included in the FAF data.

4.5 Quantity by each Mode

The FAF has data on the quantity shipped to and from the Kansas City Metropolitan Area. The units used are kilotons.

4.5.1 Quantity by Trucks

The majority of items shipped in and out of the Kansas City Metropolitan Area travel by truck. The total quantity shipped from KC by truck (includes truck, truck & rail, and air & truck modes) is 116,575 kton in 2002 and 128,730 kton in 2007. The total quantity shipped to KC by truck is 114,849 in 2002 and 126,734 kton in 2007.

4.5.2 Quantity by Rail

The total quantity shipped from KC by rail is 42,230 kton in 2002 and 15,654 kton in 2007. The total quantity shipped to KC by rail is 55,991 kton in 2002 and 23,305 kton in 2007.

4.5.3 Quantity by Water

The total quantity shipped from KC by water is 424 kton in 2002 and 437 kton in 2007. The total quantity shipped to KC by water is 135 kton in 2002 and 132 kton in 2007.

4.5.4 Quantity by Air

Quantity by air is grouped with the Air & Truck mode. Therefore, the total quantity shipped from KC by air is 16 kton in 2002 and 26 kton in 2007. The total quantity shipped to KC by air is 13 kton in 2002 and 18 kton in 2007.

4.5.5 Quantity by Pipeline

Pipeline includes pipeline commodities along with other unknown commodities. The total quantity shipped from KC by pipeline is 26,553 kton in 2002 and 27,720 kton in 2007. The total quantity shipped to KC by pipeline is 32,707 kton in 2002 and 37,258 kton in 2007.

4.6 Value by Mode

The FAF also gives values of commodities in million dollars. Table 4.5 summarizes these values by each mode. It includes travel within the metropolitan area, as well as, to and from the metropolitan area of Kansas City.

Table 4.5: Shipments by Value: 2002 and 2007 ($ Millions)

	2002						2007					
	Within Metro		From Metro		To Metro		Within Metro		From Metro		To Metro	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total	42,643	100%	119,573	100%	116,044	100%	47,478	100%	131,383	100%	128,224	100%
Truck	37,340	87.56%	79,572	66.55%	87,999	75.83%	40,870	86.08%	87,769	66.80%	96,914	75.58%
Truck & Rail	0	0%	59	0.05%	1,273	1.10%	0	0%	110	0.08%	1,216	0.95%
Air & Truck	0	0%	442	0.37%	766	0.66%	0	0%	717	0.55%	980	0.76%
Rail	185	0.43%	20,805	17.40%	5,620	4.84%	169	0.36%	20,902	15.91%	6,216	4.85%
Water	0	0%	9	0.01%	11	0.01%	0	0%	6	0.00%	15	0.01%
Other Intermodal	1,131	2.65%	8,712	7.29%	8,870	7.64%	984	2.07%	7,629	5.81%	7,864	6.13%
Pipeline & unknown	3,987	9.35%	9,974	8.34%	11,504	9.91%	5,455	11.49%	14,249	10.85%	15,018	11.71%

*From Metro and To Metro includes the Within Metro Values

CHAPTER 5 – KANSAS FREIGHT ANALYSIS FRAMEWORK DEVELOPMENT

5.1 Structure

The Kansas Metropolitan Area Freight Analysis Framework was developed as an online database using the data described in Chapter 4. It can be used to estimates tonnage and value of goods shipped by type of commodity and mode of transportation. Modes include highway, railroad, air and water. It can also show the through traffic in the Kansas City Metropolitan Area.

5.2 Assumptions

The Kansas Freight Analysis Framework has a few assumptions. When converting commodity tonnage to trucks, it is assumed that every truck is a Class 5 truck according to the FHWA Vehicle Groups. Class 5 includes Truck/Tractor Trailers with 5-axles. By using the payload by commodity, it is assumed the payloads are the same across all states.

When allocating trucks to the highways to determine through traffic, the assumption is that only the major highways are used from each direction. This is because the highways are most likely faster than the smaller one or two lane highways with lower speed limits. The highways used are shown in Chapter 4 Section 4.3. FAF data was used to calculate the number of trucks. The following modes were classified as trucks for the KFAF: Truck, Truck and Rail, and Air and Truck.

5.3 Conversion of Commodity Tonnage to Trucks

The number of trucks was computed by converting the number of tons of freight into pounds and dividing it by the Class 5 average payload of each commodity from the

FHWA Vehicle Class VIUS. The following are the classes used in the original Freight Analysis Framework along with their definitions:

Class 1 – Single Unit: 2-axle

Class 2 – Single Unit: 3-axle

Class 3 – Single Unit: 4-axle or more

Class 4 – Truck/Tractor Trailers: 4-axle or less

Class 5 – Truck/Tractor Trailers: 5-axle

Class 6 – Truck/Tractor Trailers: 6-axle or more

Class 7 – Combination Trucks: 5-axle or less

Class 8 – Combination Trucks: 6-axle

Class 9 – Combination Trucks: 7-axle or more

These payloads are shown in Table 5.1. An example of the conversion is shown in Figure 5.1.

$$\frac{\text{\# of Tons X 1000 tons X 2000lbs/1 ton}}{\text{commodity payload}} = \textbf{Number of Trucks}$$

Example for Live Animals and Fish

$$\frac{3 \text{ X } 1000 \text{ x } 2000/1}{41{,}627} = 144 \text{ trucks}$$

Figure 5.1: Formula for Converting Commodity Tonnage to Trucks

Table 5.1: Average Payload (lbs) by Commodities and FHWA Vehicle Class VIUS – National

Table 4 Average Payload (lbs) by Commodities and FHWA Vehicle Class VIUS – National									
Commodities	**Class 1**	**Class 2**	**Class 3**	**Class 4**	**Class 5**	**Class 6**	**Class 7**	**Class 8**	**Class 9**
Live animals and fish	8,374	18,579	32,102	15,028	41,627	37,426	-	-	*
Animal feed or products animal origin	9,428	24,576	32,395	15,086	44,674	23,302	54,568	37,565	63,969
Cereal grains	15,874	27,390	34,225	33,585	49,682	54,474	52,563	39,199	70,119
All other agricultural products	8,711	24,059	37,659	15,684	41,891	50,540	49,225	50,078	64,244
Basic chemicals	8,295	18,750	-	26,531	43,906	63,167	-	*	87,994
Fertilizers and fertilizer materials	10,624	24,745	20,375	13,049	45,315	43,441	*	*	72,707
Pharmaceutical products	5,802	9,000	-	*	31,289	-	-	-	-
All other chemical products	6,604	23,810	31,031	14,833	45,692	35,833	-	-	*
Alcoholic beverages	9,978	27,370	-	22,604	43,848	-	*	-	-
Bakery and milled grains	2,851	19,322	-	25,448	40,729	69,588	*	*	-
Meat, seafood, and their preparation	6,481	22,782	-	17,415	43,554	50,000	-	*	-
Tobacco products	8,045	*	-	*	42,444	-	-	-	-
All other prepared foodstuff	9,895	26,038	37,097	22,640	43,529	51,519	45,791	46,985	*
Logs and other wood in rough	7,986	27,342	38,084	24,905	49,553	53,130	-	-	74,179
Paper and paperboard articles	7,579	17,246	40,000	25,303	40,788	55,092	*	-	40,000
Printed products	6,137	18,544	-	*	35,565	-	-	-	-
Pulp, newsprint, paper, or paperboard	8,689	*	-	13,190	42,227	52,073	-	-	-
Wood products	6,665	20,215	23,982	14,210	43,441	58,837	*	*	61,909
Articles of base metal	5,191	17,950	16,614	12,700	39,979	46,527	-	*	-
Base metal – finished or semi-finished	4,563	11,801	34,103	17,091	40,697	52,761	*	-	58,225
Non-metallic mineral products	7,036	31,174	35,825	18,612	44,852	50,048	50,967	*	82,096
Non-powered tools	4,530	14,898	24,887	6,803	30,991	45,451	-	-	*
Powered tools	4,543	11,109	23,595	9,718	37,311	36,387	-	-	-
Electronic and electrical equipment	5,005	9,955	*	18,302	39,588	14,775	-	-	-
Furniture, mattresses, lamps, etc.	3,992	*	-	16,834	37,494	33,765	-	*	*

Table 5.1: Average Payload (lbs) by Commodities and FHWA Vehicle Class VIUS – National (continued)

Tobacco products	8,045	*	-	*	42,444	-	-	-	-
All other prepared foodstuff	9,895	26,038	37,097	22,640	43,529	51,519	45,791	46,985	*
Logs and other wood in rough	7,986	27,342	38,084	24,905	49,553	53,130	-	-	74,179
Paper and paperboard articles	7,579	17,246	40,000	25,303	40,788	55,092	*	-	40,000
Printed products	6,137	18,544	-	*	35,565	-	-	-	-
Pulp, newsprint, paper, or paperboard	8,689	*	-	13,190	42,227	52,073	-	-	-
Wood products	6,665	20,215	23,982	14,210	43,441	58,837	*	*	61,909
Articles of base metal	5,191	17,950	16,614	12,700	39,979	46,527	-	*	-
Base metal – finished or semi-finished	4,563	11,801	34,103	17,091	40,697	52,761	*	-	58,225
Non-metallic mineral products	7,036	31,174	35,825	18,612	44,852	50,048	50,967	*	82,096
Non-powered tools	4,530	14,898	24,887	6,803	30,991	45,451	-	-	*
Powered tools	4,543	11,109	23,595	9,718	37,311	36,387	-	-	-
Electronic and electrical equipment	5,005	9,955	*	18,302	39,588	14,775	-	-	-
Furniture, mattresses, lamps, etc.	3,992	*	-	16,834	37,494	33,765	-	*	*
Machinery	5,224	17,419	30,975	14,819	37,548	46,420	-	*	104,387
Miscellaneous manufactured products	4,451	14,994	-	21,376	37,925	35,099	-	*	-
Precision instruments and apparatus	3,468	*	-	9,782	35,042	*	*	-	-
Textile, leather, and related articles	4,542	-	-	26,496	43,969	-	-	*	-
Vehicle, including parts	6,319	19,996	13,873	14,018	36,453	36,087	-	-	*
All other transportation equipment	8,298	25,573	*	14,510	45,079	43,656	-	-	75,229
Coal	5,614	32,290	44,124	-	48,702	56,010	-	-	97,735
Crude petroleum	8,590	25,254	41,602	-	43,018	70,750	-	-	55,643
Gravel and crushed stones	11,570	30,455	39,976	18,394	45,643	47,966	48,854	49,626	85,521
Metallic ores and concentrates	*	28,390	40,294	-	52,342	-	-	-	*
Monumental or building stones	6,971	27,470	41,164	*	41,751	50,907	-	*	*
Natural sand	10,412	28,836	39,182	19,752	47,265	47,205	*	*	92,440
All other nonmetallic minerals	13,979	29,194	38,400	23,567	47,713	46,391	52,000	*	83,457
Fuel oils	15,253	24,635	40,339	31,979	51,915	69,013	-	-	77,294

Source: Freight Analysis Framework

5.4 Allocation of Trucks to Highways

Trucks were allocated to the major Kansas City highways including I-70, I-35, I-29 and 71 based on the direction the trucks are going to and from Kansas City. Some of the states were split between two directions; therefore, half of the trucks were used for each direction. For example, the trucks from the North include the following states: Alaska, Canada, Idaho (1/2), Illinois (1/2), Iowa, Minnesota, Montana, Nebraska, North Dakota, Oregon (1/2), South Dakota, Washington (1/2), Wisconsin and Wyoming (1/2). Table 5.2 shows the number of trucks for each of these regions and the total number to the KC Metro from the North using I-29 and I-35 South.

Table 5.2: Highway Distributions To Kansas City Metropolitan Area from the North

Highway Distributions To Kansas City from the North Using I-29 & I-35	
Locations	**Number of trucks**
Alaska	23
Canada	17,248
Idaho ½	851
Illinois ½	61,227
Iowa	98,457
Minnesota	19,765
Montana	1,167
Nebraska	43,254
North Dakota	1,078
Oregon ½	693
South Dakota	4,384
Washington ½	1,244
Wisconsin	15,608
Wyoming ½	1,464
Total	**266,462**

The regions from the South are listed in Table 5.3 along with the number of trucks allocated from that direction using I-35 and 71 North.

Table 5.3: Highway Distributions To Kansas City Metropolitan Area from the South

Highway Distributions To Kansas City from the South Using I-35 and 71 North	
Locations	**Number of trucks**
Arizona	797
Arkansas	77,784
Kansas ½	1,243,994
Louisiana	24,757
Mexico	6,288
Mississippi ½	3,470
New Mexico	2,091
Oklahoma	57,226
Texas	79,503
Americas	7,349
Total	**1,503,259**

The regions from the West are listed in Table 5.4 along with the number of trucks allocated from that direction using I-70 East.

Table 5.4: Highway Distributions To Kansas City Metropolitan Area from the East

Highway Distributions To Kansas City from the West using I-70 East	
Locations	**Number of trucks**
California	19,087
Colorado	48,544
Hawaii	0
Idaho ½	851
Kansas ½	1,243,994
Oregon ½	693
Utah	1,141
Nevada	284
Washington ½	1,244
Wyoming ½	1,464
Asia and Europe ½	7,123
Total	**1,324,425**

The regions from the East are listed in Table 5.5 along with the number of trucks allocated from that direction using I-70 West.

Table 5.5: Highway Distributions To Kansas City Metropolitan Area from the West

Highway Distributions To Kansas City from the East using I-70 West	
Locations	**Number of Trucks**
Alabama	13,019
Connecticut	953
DC	47
Delaware	876
FL	6,597
Illinois 1/2	61,227
GA	13,161
Indiana	45,414
Kentucky	26,251
Maine	6,397
Massachusetts	1,091
MD	3,255
Michigan	48,915
Mississippi 1/2	3,470
Missouri	2,159,633
NC	11,048
New Hampshire	1,665
NJ	5,906
NY	29,245
Ohio	52,418
Penn	19,674
Rhode Island	2,650
SC	6,872
Tenn	20,108
VA	5,420
VT	852
W. VA	548
Asia and Europe 1/2	7,123
Total	**2,553,836**

The highway distributions from Kansas City Metropolitan Area are shown in Tables 5.6-5.9.

Table 5.6: Highway Distributions From Kansas City Metropolitan Area to the North

Highway Distributions From Kansas City To the North using I-29 & I-35 North	
Locations	**Number of Trucks**
Alaska	193
Canada	23,702
Idaho 1/2	821
Illinois 1/2	36,459
Iowa	78,810
Minnesota	24,133
Montana	1,629
Nebraska	104,338
North Dakota	442
Oregon 1/2	1,510
South Dakota	9,677
Washington 1/2	1,314
Wisconsin	14,314
Wyoming 1/2	2,324
Total	**299,666**

Table 5.7: Highway Distributions From Kansas City Metropolitan Area to the East

Highway Distributions From Kansas City to the East using I-70 East	
Locations	**Number of Trucks**
Alabama	34,082
Connecticut	1,753
DC	351
Delaware	310
FL	16,485
Illinois 1/2	36,459
GA	15,067
Indiana	31,760
Kentucky	9,068
Maine	964
Massachusetts	2,096
MD	4,040
Michigan	9,534
Mississippi 1/2	7,310
Missouri	2.347.495
NC	19,139
New Hampshire	3,430
NJ	7,059
NY	5,145
Ohio	18,114
Penn	13,223
Rhode Island	595
SC	2,595
Tenn	24,738
VA	4,451
VT	57
W. VA	5,220
Asia and Europe 1/2	6,547
Total	**2,627,088**

Table 5.8: Highway Distributions From Kansas City Metropolitan Area to the South

Highway Distributions From Kansas City to the South using I-35 and 71 South	
Locations	**Number of Trucks**
Arizona	8,205
Arkansas	147,328
Kansas 1/2	1,121,290
Louisiana	14,821
Mexico	8,657
Mississippi 1/2	7,310
New Mexico	2,861
Oklahoma	99,248
Texas	133,690
Americas	4,600
Total	**1,548,009**

Table 5.9: Highway Distributions From Kansas City Metropolitan Area to the West

Highway Distributions From Kansas City to the West using I-70 West	
Locations	**Number of Trucks**
CA	32,848
Colorado	35,471
Hawaii	0
Idaho 1/2	821
Kansas 1/2	1,121,290
Oregon 1/2	1,510
Utah	13,466
Nevada	1,953
WA 1/2	1,314
Wyoming 1/2	2,324
Asia and Europe 1/2	6,547
Total	**1,217,545**

5.5 Through Trucks

The through traffic is calculated by adding the number of trucks into Kansas City and the number of trucks out of Kansas City then subtracting this number from the truck counts given by KDOT and MODOT. Table 5.10 shows the calculated through traffic per year, with a total of 23,158,050 trucks traveling through Kansas City Metropolitan Area without stopping.

Table 5.10: Kansas City Metropolitan Area Through Traffic Per Year

Intersection	Trucks from KDOT/MODOT	Trucks to KC + Trucks from KC	Through Traffic Per Year
	A	B	A-B
I-70E before K-7 (West of KCK)	10,475,500	2,541,971	7,933,529
I-35N at Miami Co. Line & I-71N at Cass Co. Line (South of KC)	12,373,865	3,051,268	9,322,597
I-29S at Platte Co. Line & I-35S at Clay Co. Line (North of KC)	6,440,425	566,128	5,874,297
I-70W at Jackson Co. and Lafayette Co. Borders (East of KC)	5,208,550	5,180,924	27,626
Total	34,498,340	11,340,290	**23,158,050**

5.6 Projections

Two projections/ forecasts methods were developed. One method allows a user to enter a percentage increase and another utilizes the 2002 and 2007 FAF data. In the first method, the KFAF user is able to enter a percent increase or decrease for all commodities or select different percentages for up to four commodities. Then, commodity, mode, or truck traffic views are shown in a single table. In the second method, the 2002 and 2007 FAF data is used to find an average increase for one year. Then the years 2011, 2013 and 2018 are forecasted.

5.7 User Manual

The KFAF is a web-accessible, commodity-destination database that allows registered users to quickly view collected data from past years along with estimations of future shipments to and from the greater Kansas City Metropolitan Area. The KFAF website is currently being hosted at www.ittc.ku.edu/~vbuhr/kfaf2.html. It contains data from the 2002 and 2007 versions of the Freight Analysis Framework, which can be found online at http://ops.fhwa.dot.gov/freight/freight_analysis/faf/index.htm. This document highlights the central features of the KFAF and goes into detail on its technical implementation.

5.7.1 Features

At the introduction page of the KFAF website, a user sees a paragraph introducing KFAF. At the right part of the page is a panel for user login/registration. This page is shown in Figure 5.2. Only registered users may have access to contents of the KFAF website. New users may register themselves using the registration panel and the

system administrator needs to approve new registered users before the users are allowed to log in.

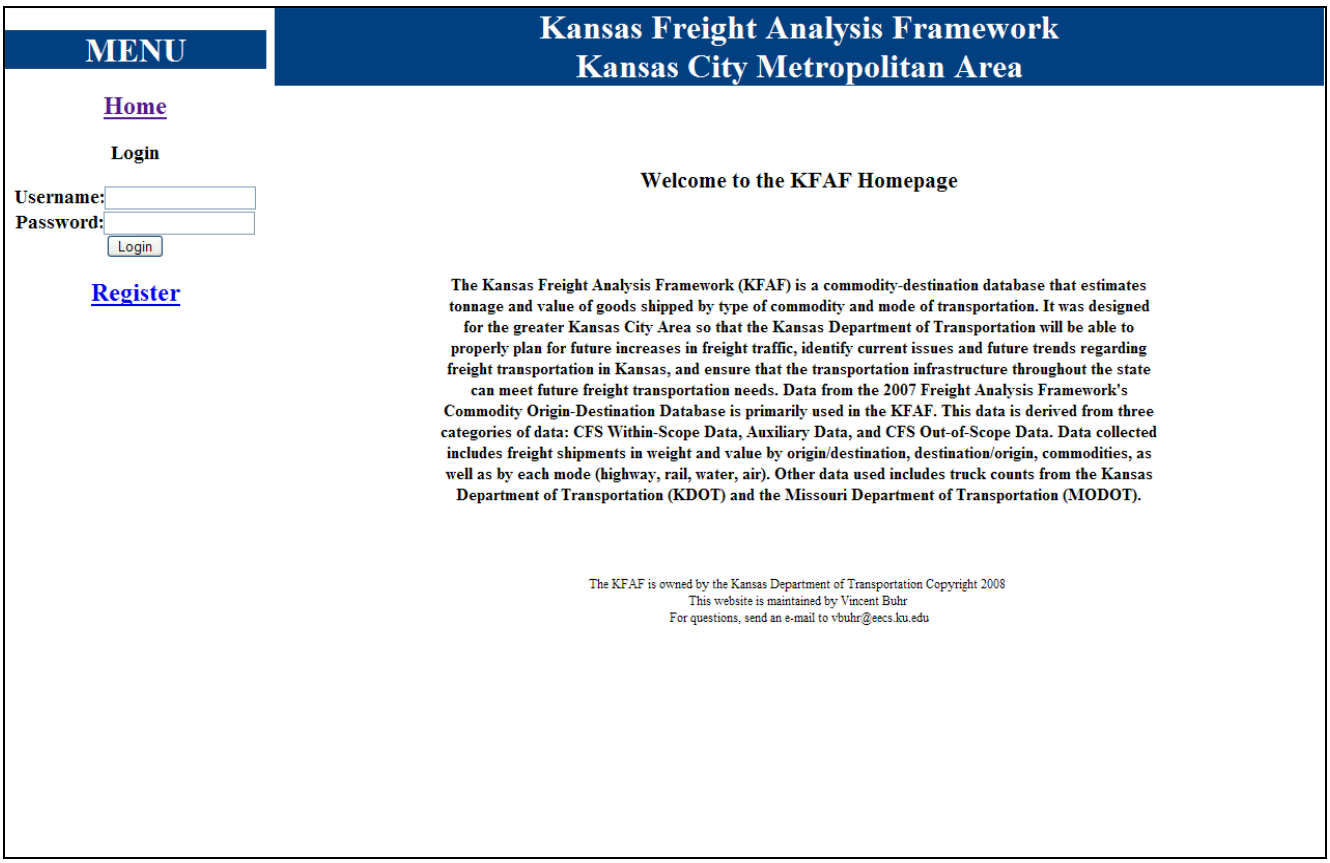


Figure 5.2: KFAF Homepage

Once users have logged in, they have access to a menu on the left side of the screen that allows them to navigate between KFAF features as shown in Figure 5.3. First off, they can view data on shipments to or from KC based on the type of commodity shipped, mode of shipment, or an estimation of the number of trucks used in shipping. The user selects the destination/origin state first and then city, the areas available for selection are taken from the FAF data as shown in Figure 5.4.

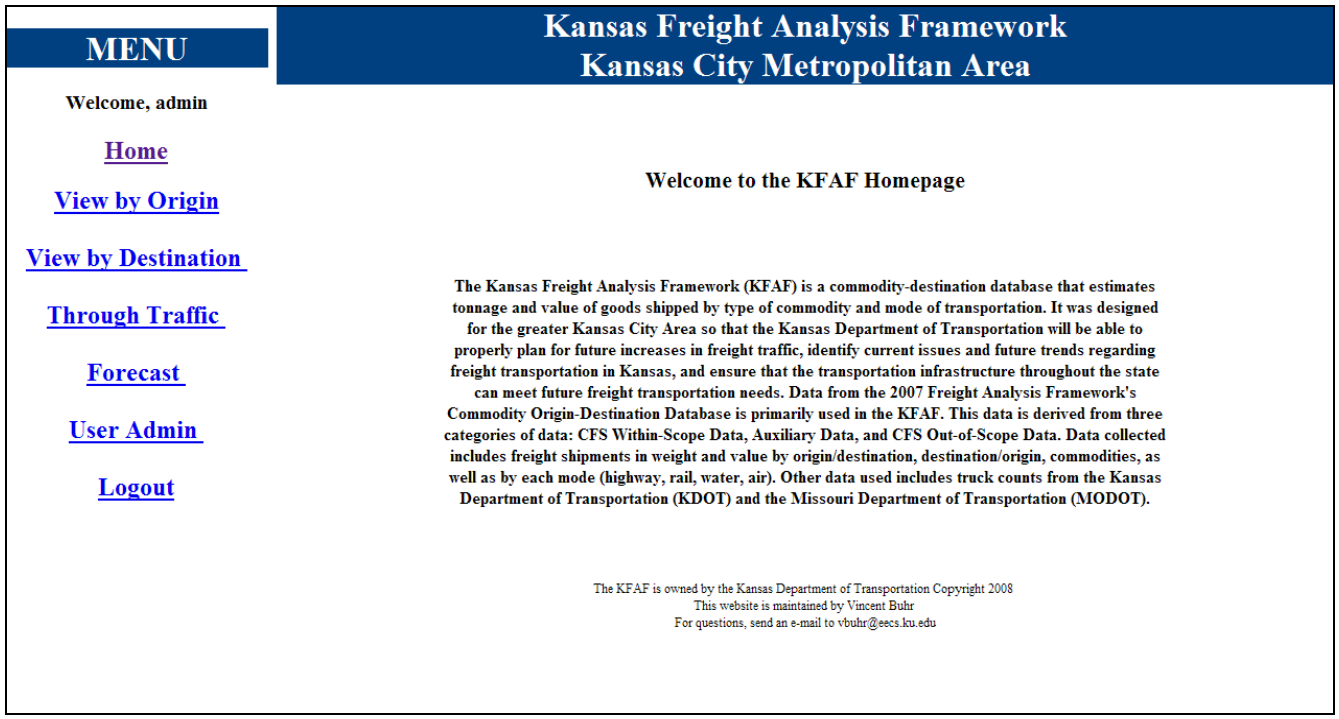


Figure 5.3: Navigation Menu

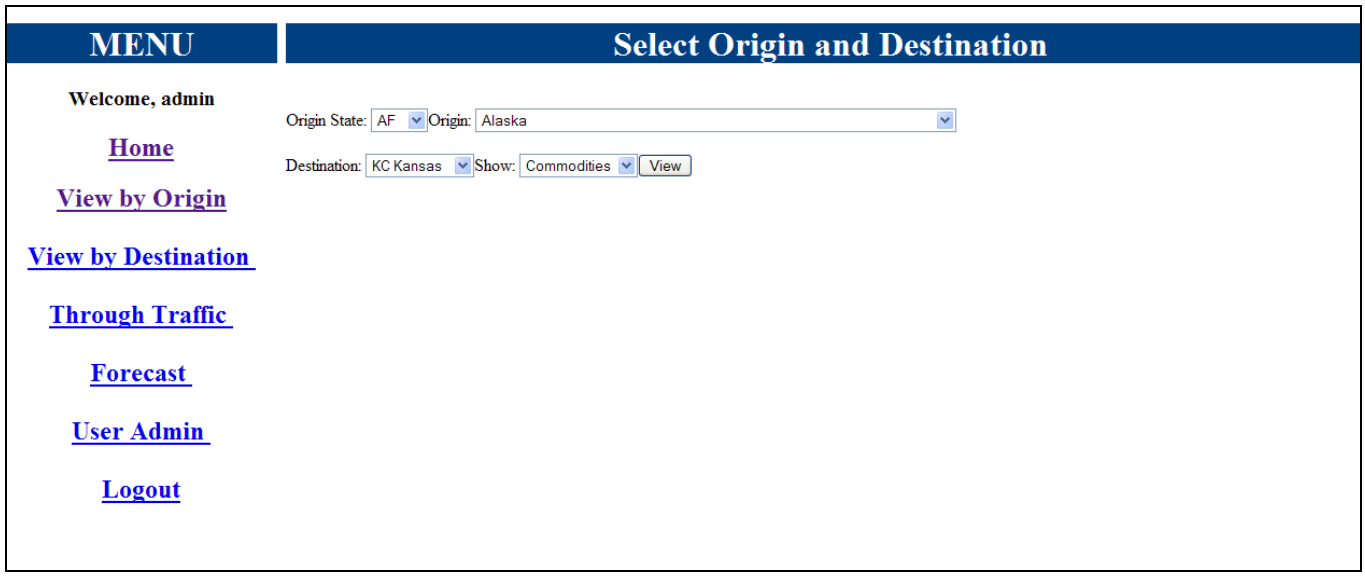


Figure 5.4: Origin/Destination Selection Screen

The next selection in the navigation menu is ‘Through Traffic’ which shows a table of the estimated number of trucks that pass through Kansas City from each direction on their way to other cities. Additionally, there is a map of the KC area that allows the user to mouse over the applicable intersections to view the truck counts shown in Figure 5.5.

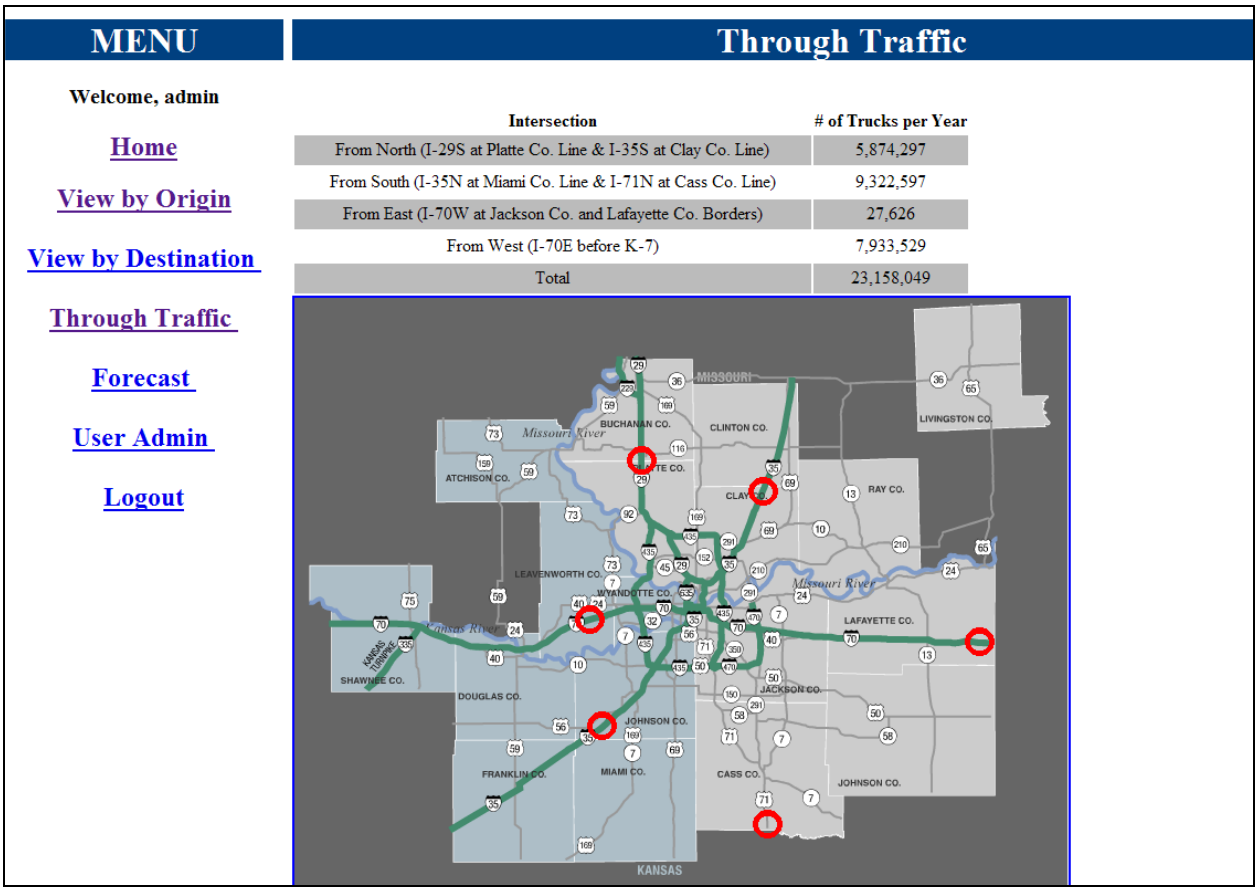


Figure 5.5: Through Traffic View

The Forecast feature gives the user multiple options to estimate the future traffic that will come to or go from KC, which is shown in Figure 5.6. The first option ‘Forecast Using FAF Data’ compares the 2002 and 2007 truck traffic data and estimates traffic for 3, 5, and 10 years in the future. The second option, ‘Forecast Using Selected Percentage’ allows the user to set a percent increase or decrease in traffic for all

commodities to propagate to the future estimations. Additionally, the user can select up to four commodities to specify a percentage for independently of the rest for special consideration. As with the origin/destination views, forecasting allows the user to select from ‘Commodity’, ‘Mode’, or ‘Truck Traffic’ views, and the forecasted results are all in a single table. See Figure 5.7.

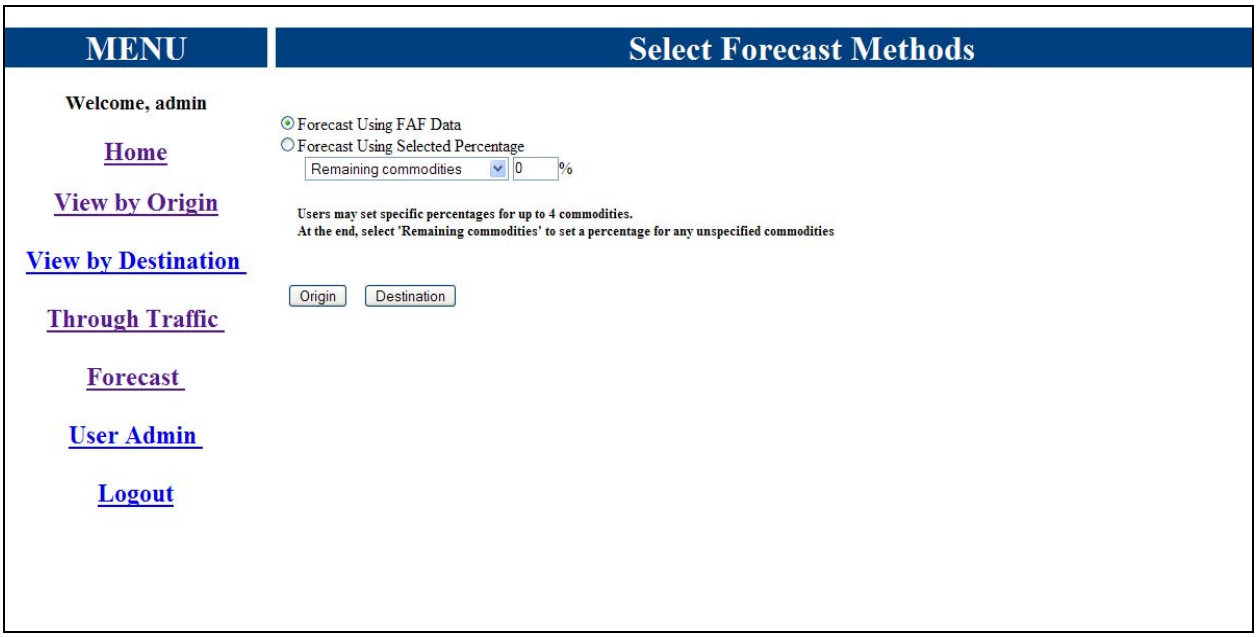
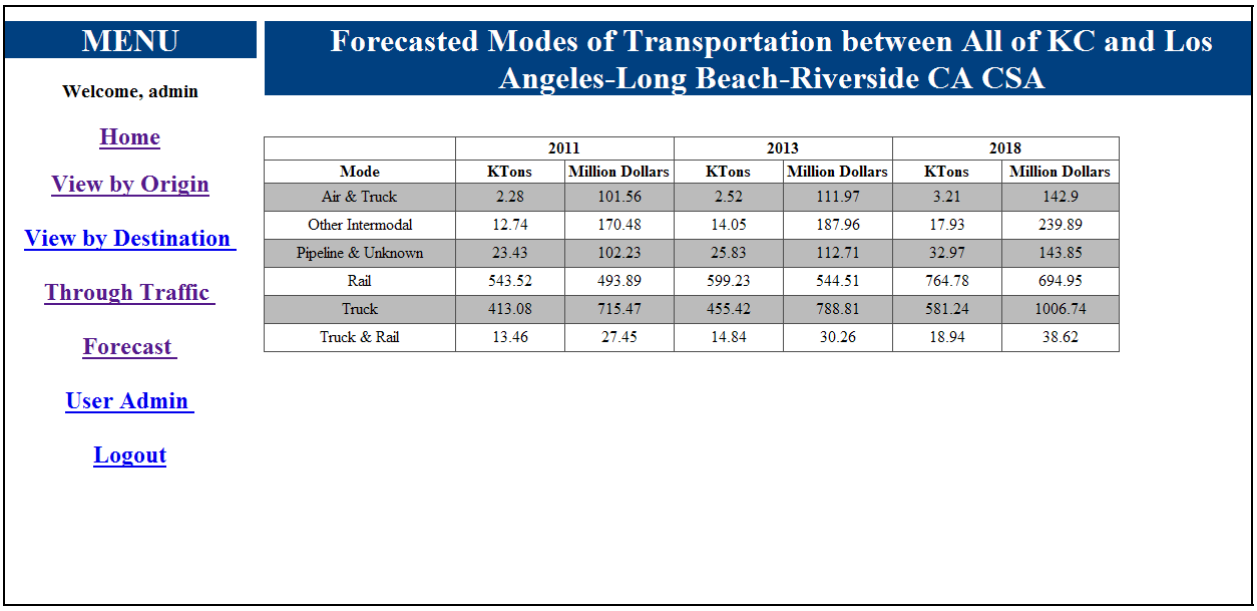


Figure 5.6: Forecast View Selection



	2011		2013		2018	
Mode	KTons	Million Dollars	KTons	Million Dollars	KTons	Million Dollars
Air & Truck	2.28	101.56	2.52	111.97	3.21	142.9
Other Intermodal	12.74	170.48	14.05	187.96	17.93	239.89
Pipeline & Unknown	23.43	102.23	25.83	112.71	32.97	143.85
Rail	543.52	493.89	599.23	544.51	764.78	694.95
Truck	413.08	715.47	455.42	788.81	581.24	1006.74
Truck & Rail	13.46	27.45	14.84	30.26	18.94	38.62

Figure 5.7: Forecast View

Finally, users logged in as an administrator have access to the 'User Admin' page which is where newly registered users can be approved or user accounts can be deleted as shown in Figure 5.8.

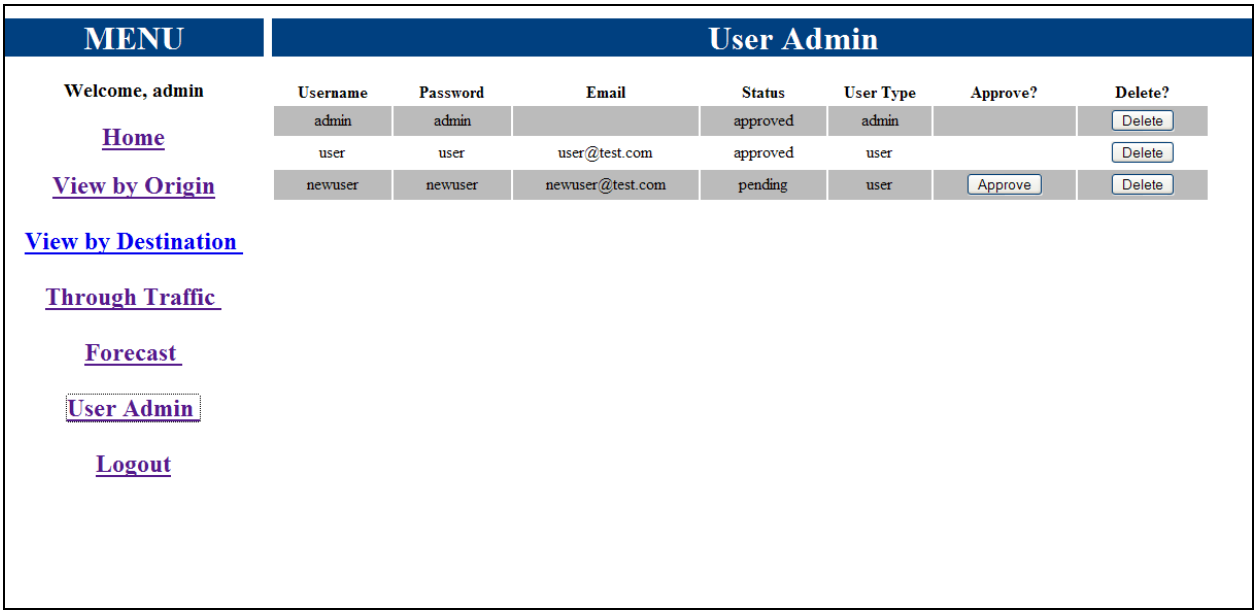


Figure 5.8: User Admin

5.7.2 Technical Documentation

The KFAF Web-Accessible Database was largely implemented using HTML and Perl, along with a simple CSS stylesheet for title and table emphasis. The Perl CGI module is used to handle creating any page that requires logging in to view, and CGI::Sessions is used to handle keeping track of logged in users. The FAF data was ported to a PostgreSQL database hosted by the ITTC department at the University of Kansas. While data not pertaining to the Kansas City area has been taken out, the format of the data has been kept the same as it was in the FAF .mdb files.

CHAPTER 6 – CONCLUSIONS AND RECOMMENDATIONS

The purpose of this chapter is to state the conclusions and recommendations that the researchers have determined based on the literature review (Chapter 3), data collection (Chapter 4), and KFAF Development (Chapter 5).

6.1 Conclusions

Based on the results of this project, the following conclusions are made:

1. In 2007, the top 5 commodities shipped to the Kansas City Metropolitan Area by weight include cereal grains, gravel, nonmetal mineral products, waste/scrap and unknown goods.
2. In 2007, the top 5 commodities shipped from the Kansas City Metropolitan Area by weight include cereal grains, gravel, nonmetal mineral products, waste/scrap and other agricultural goods.
3. In 2007, the top 5 commodities shipped to the Kansas City Metropolitan Area by value include machinery, mixed freight, motorized vehicles, pharmaceuticals, and electronics.
4. In 2007, the top 5 commodities shipped from the Kansas City Metropolitan Area by value include machinery, mixed freight, motorized vehicles, pharmaceuticals, and textiles/leather.

5. The KFAF is a web-accessible, commodity-destination database that allows registered users to quickly view collected data from past years along with estimations of future shipments to and from the greater Kansas City Metropolitan Area. Currently, it contains data from the 2002 and 2007 versions of the Freight Analysis Framework, which can be found online at http://ops.fhwa.dot.gov/freight/freight_analysis/faf/index.htm.
6. The KFAF can be used by KDOT planners when making decisions for maintaining an adequate infrastructure in Kansas.
7. The framework of the KFAF can be used to develop a freight analysis model for other cities in the State of Kansas once reliable data becomes available.

6.2 Recommendations

The results of this research also lead the researchers to certain recommendations in order to improve the KFAF. Based on the results of this research project, the following recommendations are made:

1. There is a need to improve the accuracy of the data and determine if a more accurate data source could be developed for the Kansas City Area.
2. There is a need to apply more specific assumptions to the types of trucks used. 18 wheelers were assumed to ship all commodities in this study. However, in reality a combination of trucks were used to ship commodities in and out of Kansas City.
3. The through truck calculations could be improved with a more accurate way of choosing in and out locations.

4. There is a need to consider the future intermodal facilities and the new manufacturing warehouses in the projections and forecasts of truck numbers and commodity shipments.
5. MODOT and KDOT need to work together to provide a transportation plan for the Kansas City Metropolitan Area.
6. There is a need to study the effects of the new light rail plan on future transportation issues.
7. There is a need to study the impact of the through truck traffic on the Kansas City highways, such as highway capacity, road conditions, and maintenance costs.

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APPENDIX A - SUPPLEMENTARY MAPS, GRAPHS & TABLES

Table A1: First Level (2-digit) SCTG Definitions

SCTG	Description
01	Live Animals and Fish
02	Cereal Grains (including seed)
03	Other Agricultural Products, except for Animal Feed
04	Animal Feed and Products of Animal Origin, n.e.c.
05	Meat, Fish, and Seafood, and Their Preparations
06	Milled Grain Products and Preparations, and Bakery Products
07	Other Prepared Foodstuffs, and Fats and Oils
08	Alcoholic Beverages
09	Tobacco Products
10	Monumental or Building Stone
11	Natural Sands
12	Gravel and Crushed Stone
13	Non-Metallic Minerals, n.e.c.
14	Metallic Ores and Concentrates
15	Coal
16	Crude Petroleum Oil
17	Gasoline and Aviation Turbine Fuel
18	Fuel Oils
19	Coal and Petroleum Products, n.e.c.
20	Basic Chemicals
21	Pharmaceutical Products
22	Fertilizers
23	Chemical Products and Preparations, n.e.c.
24	Plastics and Rubber
25	Logs and Other Wood in the Rough
26	Wood Products
27	Pulp, Newsprint, Paper, and Paperboard
28	Paper or Paperboard Articles
29	Printed Products
30	Textiles, Leather, and Articles of Textiles or Leather
31	Non-Metallic Mineral Products
32	Base Metal in Primary or Semi-Finished Forms and in Finished Basic Shapes
33	Articles of Base Metal
34	Machinery
35	Electronic and Other Electrical Equipment and Components, and Office Equipment
36	Motorized and Other Vehicles (including parts)
37	Transportation Equipment, n.e.c.
38	Precision Instruments and Apparatus
39	Furniture, Mattresses and Mattress Supports, Lamps, Lighting Fittings, and Illuminated Signs
40	Miscellaneous Manufactured Products
41	Waste and Scrap
43	Mixed Freight

n.e.c. = not elsewhere classified

Source: Report 4: FAF Commodity Classification

Table A2: Geographic Zones for the 2002 and 2007 Freight Analysis Framework

FAF Regions

Domestic FAF regions are based on Metropolitan Statistical Areas (MeSAs), Consolidated Statistical Areas (CSAs), and states or balances of states.

Region ID	BTS/Census Commodity Flow Survey Region Name	FAF Database Abbreviation	FAF State/Regio
1	Birmingham-Hoover-Cullman, AL CSA	AL Birmi	AL
2	Remainder of Alabama	AL rem	AL
3	Alaska	AK	AK
4	Phoenix-Mesa-Scottsdale, AZ MeSA	AZ Phoen	AZ
5	Tucson, AZ MeSA	AZ Tucso	AZ
6	Remainder of Arizona	AZ rem	AZ
7	Arkansas	AR	AR
8	Los Angeles-Long Beach-Riverside, CA CSA	CA Los A	CA
9	San Diego-Carlsbad-San Marcos, CA MeSA	CA San D	CA
10	Sacramento--Arden-Arcade--Truckee, CA-NV CSA (CA Part)	CA Sacra	CA
11	San Jose-San Francisco-Oakland, CA CSA	CA San J	CA
12	Remainder of California	CA rem	CA
13	Denver-Aurora-Boulder, CO CSA	CO Denve	CO
14	Remainder of Colorado	CO rem	CO
15	New York-Newark-Bridgeport, NY-NJ-CT-PA CSA (CT Part)	CT New Y	CT
16	Remainder of Connecticut	CT rem	CT
17	Delaware	DE	DE
18	Washington-Arlington-Alexandria, DC-VA-MD-WV MeSA (DC Part)	DC Washi	DC

19	Jacksonville, FL MeSA	FL Jacks	FL
20	Miami-Fort Lauderdale-Miami Beach, FL MeSA	FL Miami	FL
21	Orlando-The Villages, FL CSA	FL Orlan	FL
22	Tampa-St Petersburg-Clearwater, FL MeSA	FL Tampa	FL
23	Remainder of Florida	FL rem	FL
24	Atlanta-Sandy Springs-Gainesville, GA-AL CSA (GA Part)	GA Atlan	GA
25	Remainder of Georgia	GA rem	GA
26	Honolulu, HI MeSA	HI Honol	HI
27	Remainder of Hawaii	HI rem	HI
28	Idaho	ID	ID
29	Chicago-Naperville-Michigan City, IL-IN-WI CSA (IL Part)	IL Chica	IL
30	St Louis, MO-IL MeSA (IL Part)	IL St Lo	IL
31	Remainder of Illinois	IL rem	IL
32	Chicago-Naperville-Michigan City, IL-IN-WI CSA (IN Part)	IN Chica	IN
33	Indianapolis-Anderson-Columbus, IN CSA	IN India	IN
34	Remainder of Indiana	IN rem	IN
35	Iowa	IA	IA
36	Kansas City, MO-KS MeSA (KS Part)	KS Kansa	KS
37	Remainder of Kansas	KS rem	KS
38	Louisville-Elizabethtown-Scottsburg, KY-IN CSA (KY Part)	KY Louis	KY
39	Remainder of Kentucky	KY rem	KY
40	New Orleans-Metairie-Bogalusa, LA CSA	LA New O	LA

41	Remainder of Louisiana	LA rem	LA
42	Maine	ME	ME
43	Baltimore-Towson, MD MeSA	MD Balti	MD
44	Washington-Arlington-Alexandria, DC-VA-MD-WV MeSA (MD Part)	MD Washi	MD
45	Remainder of Maryland	MD rem	MD
46	Boston-Worcester-Manchester, MA-NH CSA (MA Part)	MA Bosto	MA
47	Remainder of Massachusetts	MA rem	MA
48	Detroit-Warren-Flint, MI CSA	MI Detro	MI
49	Grand Rapids-Wyoming-Holland, MI CSA	MI Grand	MI
50	Remainder of Michigan	MI rem	MI
51	Minneapolis-St Paul-St Cloud, MN-WI CSA (MN Part)	MN Minne	MN
52	Remainder of Minnesota	MN rem	MN
53	Mississippi	MS	MS
54	Kansas City, MO-KS MeSA (MO Part)	MO Kansa	MO
55	St Louis-St Charles-Farmington, MO-IL CSA (MO Part)	MO St Lo	MO
56	Remainder of Missouri	MO rem	MO
57	Montana	MT	MT
58	Nebraska	NE	NE
59	Las Vegas-Paradise-Pahrump, NV CSA	NV Las V	NV
60	Remainder of Nevada	NV rem	NV
61	New Hampshire	NH	NH
62	New York-Newark-Bridgeport, NY-NJ-CT-PA CSA (NJ Part)	NJ New Y	NJ

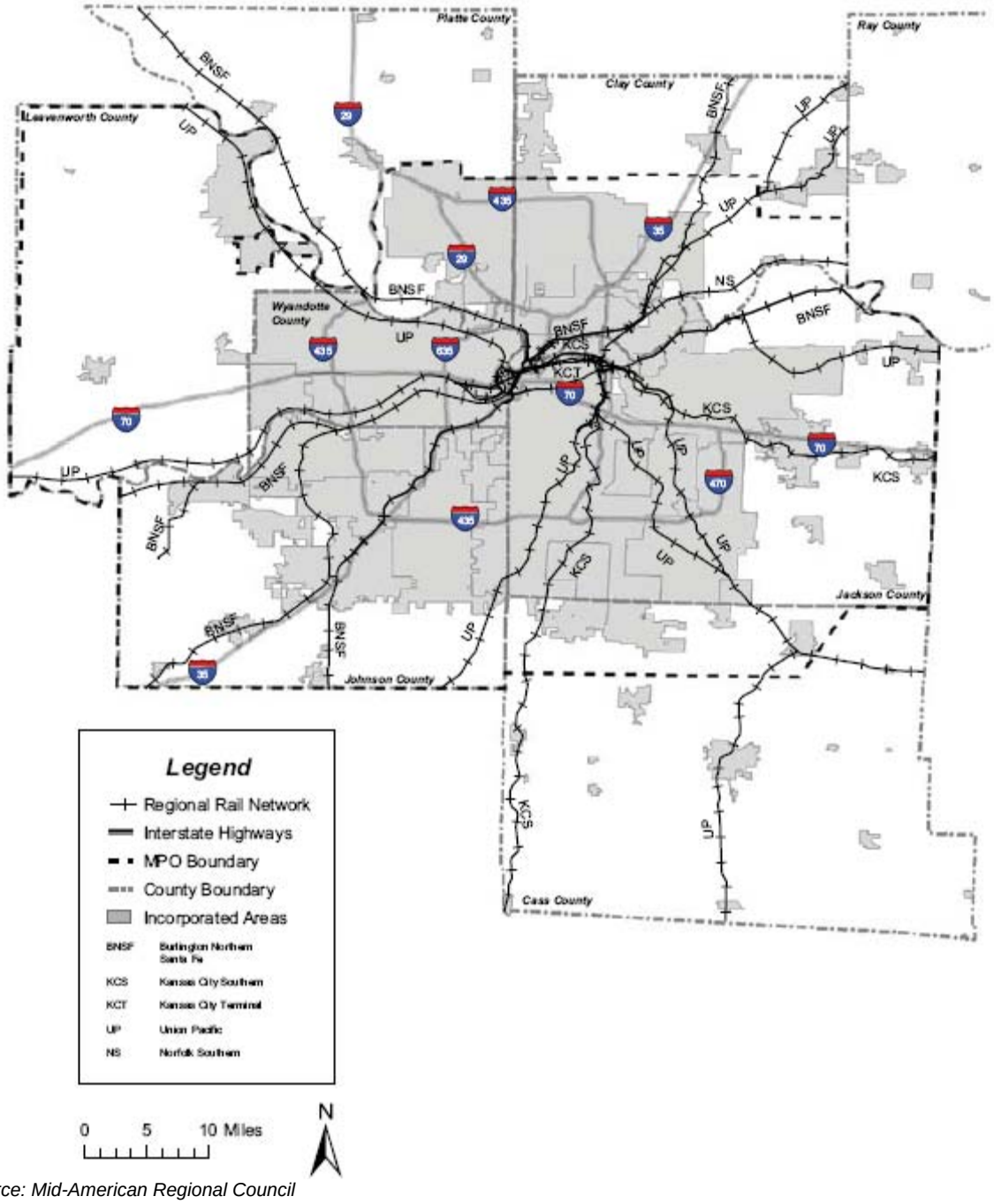
63	Philadelphia-Camden-Vineland, PA-NJ-DE-MD CSA (NJ Part)	NJ Phila	NJ
64	Remainder of New Jersey	NJ rem	NJ
65	New Mexico	NM	NM
66	Albany-Schenectady-Amsterdam, NY CSA	NY Alban	NY
67	Buffalo-Cheektowaga-Tonawanda, NY MeSA	NY Buffa	NY
68	New York-Newark-Bridgeport, NY-NJ-CT-PA CSA (NY Part)	NY New Y	NY
69	Rochester-Batavia-Seneca Falls, NY CSA	NY Roche	NY
70	Remainder of New York	NY rem	NY
71	Charlotte-Gastonia-Salisbury, NC-SC CSA (NC Part)	NC Charl	NC
72	Greensboro--Winston-Salem--High Point, NC CSA	NC Green	NC
73	Raleigh-Durham-Cary, NC CSA	NC Ralei	NC
74	Remainder of North Carolina	NC rem	NC
75	North Dakota	ND	ND
76	Cincinnati-Middletown-Wilmington, OH-KY-IN CSA (OH Part)	OH Cinci	OH
77	Cleveland-Akron-Elyria, OH CSA	OH Cleve	OH
78	Columbus-Marion-Chillicothe, OH CSA	OH Colum	OH
79	Dayton-Springfield-Greenville, OH CSA	OH Dayto	OH
80	Remainder of Ohio	OH rem	OH
81	Oklahoma City-Shawnee, OK CSA	OK Oklah	OK
82	Tulsa-Bartlesville, OK CSA	OK Tulsa	OK
83	Remainder of Oklahoma	OK rem	OK
84	Portland-Vancouver-Beaverton, OR-WA MeSA (OR Part)	OR Portl	OR

85	Remainder of Oregon	OR rem	OR
86	Philadelphia-Camden-Vineland, PA-NJ-DE-MD CSA (PA Part)	PA Phila	PA
87	Pittsburgh-New Castle, PA CSA	PA Pitts	PA
88	Remainder of Pennsylvania	PA rem	PA
89	Rhode Island	RI	RI
90	Greenville-Anderson-Seneca, SC CSA	SC Green	SC
91	Spartanburg-Gaffney-Union, SC CSA	SC Spart	SC
92	Remainder of South Carolina	SC rem	SC
93	South Dakota	SD	SD
94	Memphis, TN-MS-AR MeSA (TN Part)	TN Memph	TN
95	Nashville-Davidson--Murfreesboro--Columbia, TN CSA	TN Nashv	TN
96	Remainder of Tennessee	TN rem	TN
97	Austin-Round Rock, TX MeSA	TX Austi	TX
98	Dallas-Fort Worth, TX CSA	TX Dalla	TX
99	Houston-Baytown-Huntsville, TX CSA	TX Houst	TX
100	San Antonio, TX MeSA	TX San A	TX
101	Remainder of Texas	TX rem	TX
102	Salt Lake City-Ogden-Clearfield, UT CSA	UT Salt	UT
103	Remainder of Utah	UT rem	UT
104	Vermont	VT	VT
105	Richmond, VA MeSA	VA Richm	VA
106	Virginia Beach-Norfolk-Newport News, VA-NC MeSA (VA Part)	VA Virgi	VA

107	Washington-Baltimore-Northern Virginia, DC-MD-VA-WV CSA (VA Part)	VA Washi	VA
108	Remainder of Virginia	VA rem	VA
109	Seattle-Tacoma-Olympia, WA CSA	WA Seatt	WA
110	Remainder of Washington	WA rem	WA
111	West Virginia	WV	WV
112	Milwaukee-Racine-Waukesha, WI CSA	WI Milwa	WI
113	Remainder of Wisconsin	WI rem	WI
114	Wyoming	WY	WY

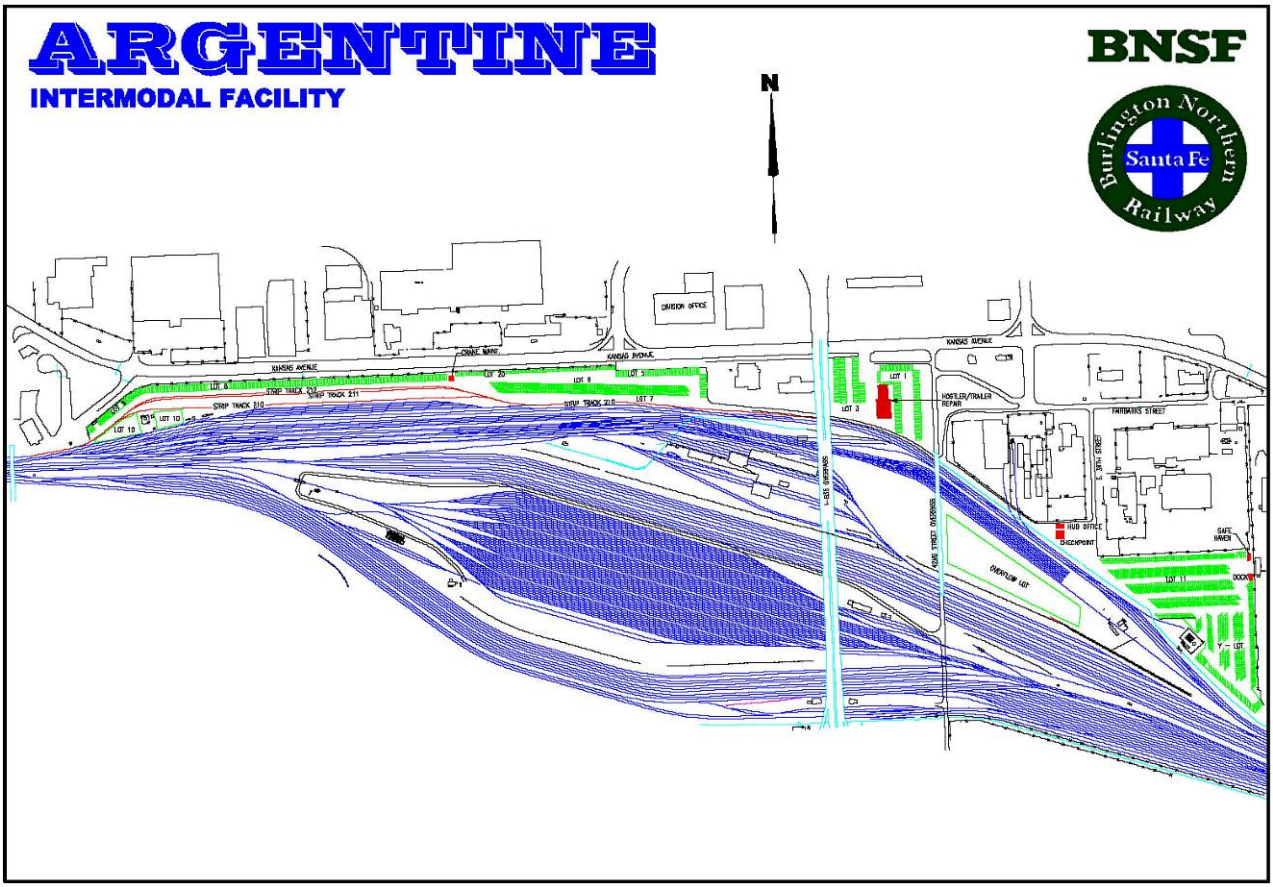
Region ID	FAF Foreign Trade Regions	FAF Database Abbreviation	FAF State/Region
132	Canada	Canada	CN
133	Mexico	Mexico	MX
134	Latin and South America	Americas	AM
135	Asia	Asia E&S	AS
136	Europe	Europe	EU
137	Rest of World	Rest of World	AF
138	Middle East	SW Asia	SW

Source: Freight Analysis Framework



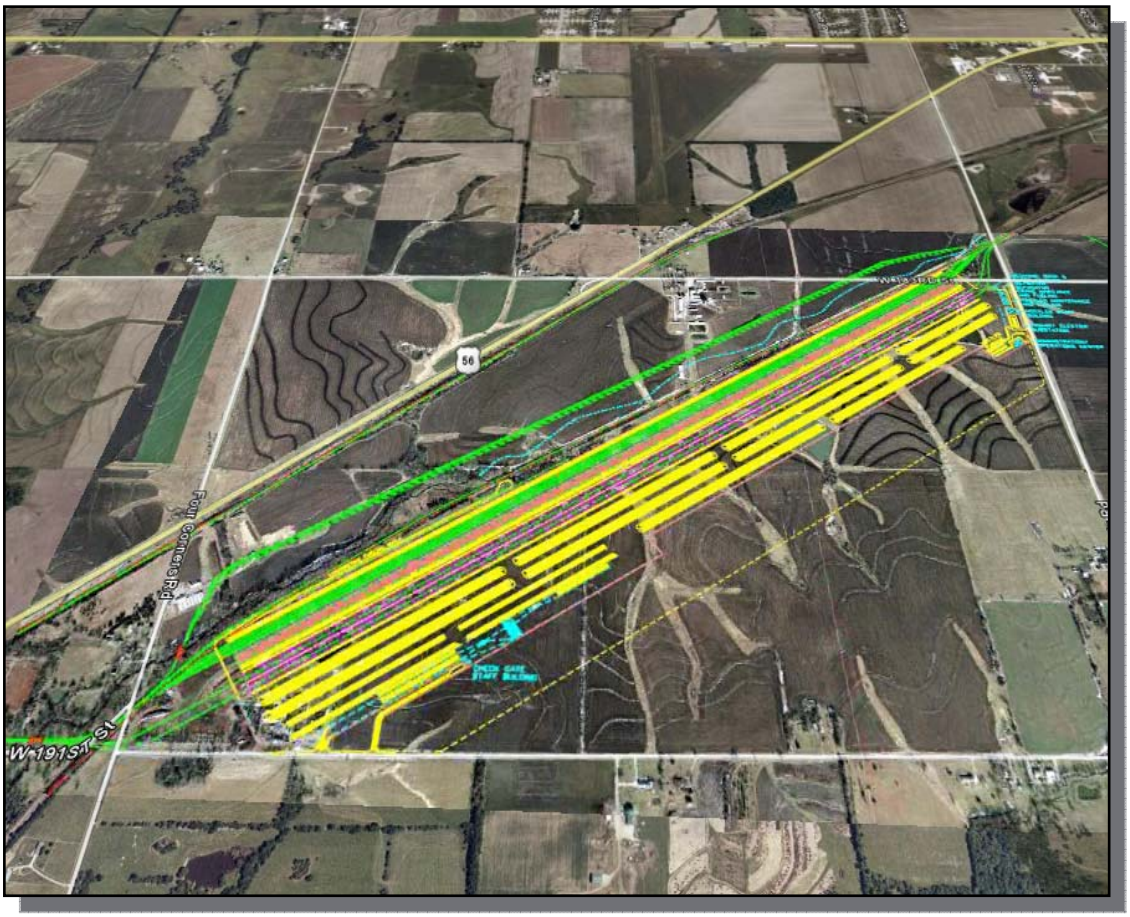
Source: Mid-American Regional Council

Figure A1: Kansas City Metropolitan Rail Network



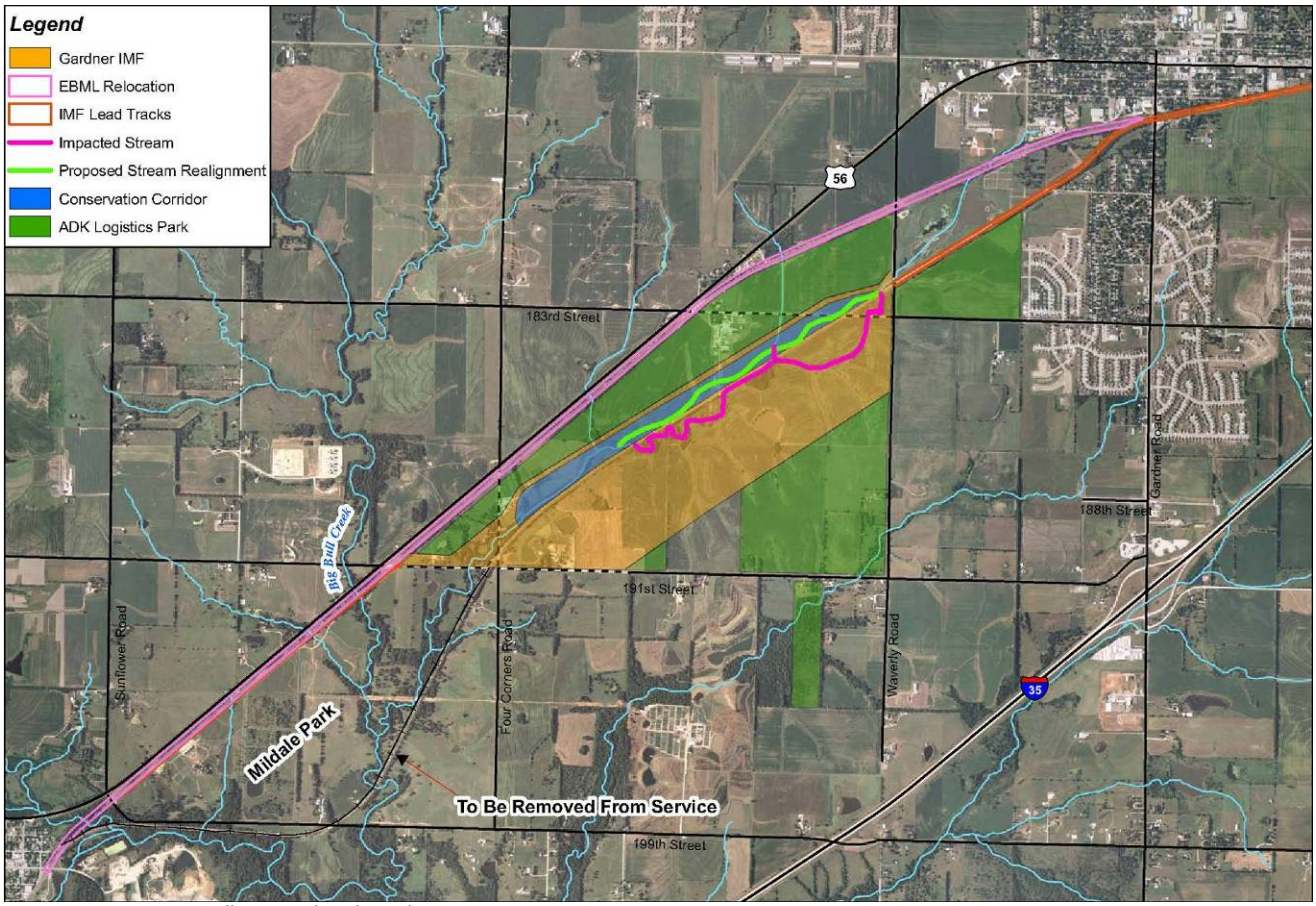
Source: BNSF Railway

Figure A2: Argentine Intermodal Facility Layout



Source: BNSF Railway & City of Gardner, KS

Figure A3: Gardner Intermodal Facility Site



Source: BNSF Railway & City of Gardner, KS

Figure A4: Gardner Intermodal Environmental Considerations

Table A3: Issues Associated with Proposed Intermodal and Logistics Park - Benefits

Benefit Category	Description	Benefit/Impact
Economic Development		
Reduction in property tax burden placed on homeowners	Intermodal/Logistics Park project to increase commercial property burden from 15% to ~50%, lessening residential tax burden	Decreases need to raise property taxes
Daytime economy creation for retail	Workers at the Intermodal/Logistics Park would increase demand for retail services	Increase in local employment and service opportunities
Increased property tax revenues	~Projected City revenues = $58 million over 20 years, currently $2 million ~Projected School revenues = $190 million over 20 years	~Increase from $2M to $4M yearly to City ~New revenue to pay for $130M for new schools required in next 10 yrs.
Transportation		
Improvement of Waverly Rd., 191st St., 183rd St., and Four Corners Rd.	Waverly Road, 191st Street, 183rd Street, Four Corners Road would be improved	Development pays for improvements, not City
Widening of Center St. bridge	Center Street Bridge would be improved to four lanes, a need that is required without the Logistics Park.	Development pays for improvements, not City
Reduction of train horns and removal of at grade crossings	Reduction of most of the train horn sounds and making local traffic safer by eliminating certain at grade crossings because of road closures & construction of overpasses.	Less train horns and safer rail crossings
New I-35 interchange south of Gardner Road	New interchange designated for truck traffic is built - new traffic would be directed away from Gardner Road.	Safety and traffic improvements by not using Gardner Rd. interchange
East/West road enhancement for southern Johnson County	New interchange could spur the east/west major thoroughfare/bypass in Johnson County	Provide major east/west roadway improvement
Land Use		
Single developer of property	Development of proposed project area not easily accomplished; not planned for residential as parcel has 2 major tracks crossing it, roads are gravel with at grade crossings, City's wastewater plan only calls for servicing just one large lot depth to the west of Waverly. Because of these characteristics, a single owner with a master plan could better manage development obstacles and allow for better design continuity, planning, construction and ongoing maintenance of the development.	Single property owner can more efficiently & effectively develop a large parcel of property that has significant obstacles because of multiple rail lines
Environment		
At-grade crossings & train whistles	Train horn noise to decrease by eliminating several at-grade crossings, negating the need for horns at those intersections.	Elimination of at-grade crossings & need for train whistles
Number of trains that pass through Gardner	Fewer trains would travel through Gardner if the Intermodal was built west of town. Many trains would arrive from the west, unload, then return directly back to the west coast.	Reduction in number of trains
City Services (non-utility)		
Impact fee revenues to City	The City would receive Park Impact Fees on all new development related to the Logistics Park and the development within	City to receive additional park impact fee revenues
Property tax revenues	Property taxes would be generated in excess of site maintenance requirements; used to enhance city services throughout City	City to receive additional property taxes
City Services (Electric)		
Electric revenues	City would receive increased electric revenues that could minimize any needed rate increases.	City to receive Increase in electric utility revenues
Second interconnection to KCPL for the City	BNSF would be required to participate in 2nd interconnection to KCPL's transmission line and in the 4th substation for the City. This substation is required in future w/o Intermodal.	New interconnection would improve grid system
Increased base load for City	Increased base electric load for city system increases City's ability to secure lower cost energy supply resources.	Increased base equates to lower cost to purchase electricity
City Services (Water)		
City and Rural Water District #7 can supply water	Provision of water services to the site would likely be shared between City Water & RW7.	Water supply is available for development
City has water main in area	The City currently has a 12" main serving that portion of the site within its boundary so no additional mains would need to be constructed.	No additional water mains required
Water demand is low	Water demand is anticipated to be low and would not require significant, if any, expansion in treatment, distribution, or water rights.	Low water use projected lessening impact on system
City Services (Wastewater)		
NA		

Source: City of Gardner, KS

Table A4: Issues Associated with Proposed Intermodal and Logistics Park - Concerns

Concern Category	Description	Detailed Concern
Economic Development		
Public incentives	Taxpayers throughout the city could have to partially pay for improvements for the Logistics Park if tax abatements or other incentives are used to assist in the development.	Could reduce positive economic benefit
Future costs paid by City	Future tax revenues may be required for utility and road development, as well as maintenance of the infrastructure and other city services such as public safety.	Future revenues may be needed to help pay for services, utilities & infrastructure for development
Low wage jobs	The number of employees at starting wages may create a demand for temporary or less expensive housing	Low wage jobs could adversely affect economic mix of community
Truck traffic increases	Major increases in truck traffic could adversely impact existing and future residential and retail development	Traffic problems could impede residential & retail development
Transportation		
Increased truck traffic	2,000 truck trips per day at inception to between 5 to 8,000 truck trips at build-out in approximately 15 yrs. While many trips are local within logistics facility, I-35 will get significant additional traffic. Build- out projections are for 59,000 total vehicle trips (cars and trucks) which includes the employee traffic.	Up to 8,000 truck trips a day in 15 yrs. could cause hardship
Gardner Road & I-35 interchange	Gardner Road interchange cannot handle additional truck traffic generated by the Intermodal and logistics facilities.	Current interchanges unable to handle new truck traffic
Gardner Road & I-35 Interchange	Gardner Road interchange should not be used for Intermodal traffic because of the Nike School traffic located on the south side of I-35	Current & projected school traffic mixed with new truck traffic at interchange is a hazard
Access to cemetery	Loss of access to local cemetery	Cemetery must have public access
Edgerton traffic impact	Increased number of trucks going through Edgerton because of inability to use 56 Highway.	Increased truck traffic on unimproved roads in Edgerton
Students traveling on 56 Hwy	Conflict with trucks and School buses and high school students that drive 56 Hwy. from Edgerton to GEHS	School related traffic mixing with increased truck traffic on 56 Hwy
Trailers allowed to go to more than two	Number of trailers allowed to exceed current regulations of two trailers per semi-tractor	Longer semis on I-35
I-35 weigh stations	Back ups on I-35 at State run weigh stations between Gardner & Olathe, making more truck traffic come through town	Traffic congestion & backups at I-35 weigh stations
Trucks not following truck routes	Trucks traveling through Gardner & Edgerton; not following designated routes	Truck traffic off routes
Construction traffic	Traffic during construction of the Intermodal and Logistics facilities	Construction traffic in Gardner

Land Use		
Property values of adjacent homes	Location is within one-half mile of residential subdivisions to north & east. Though not shown at other two logistics park sites in Alliance TX and Elwood IL, there is concern about loss of home value. May be stigma attached to rail project that may affect surrounding area. Visibility of high industrial use during day & lighting issues could adversely affect the area.	Because of industrial of uses development could adversely affect home values
Noise & light pollution near park	Noise & lights may detract from the County Park to the west.	Noise & lighting could affect County Park
Batch plant location	Location of batch plant during construction of Intermodal and Logistics facilities	Batch plant could affect neighbors
Environment		
Lighting impact on neighborhoods	Lights may impact the residential neighborhoods	Lighting could affect neighbors
Storm water runoff	Additional storm runoff could adversely affect or damage the streams & Hillsdale Lake	Storm drainage could affect area
Water contamination from containers	Leaking containers could contaminate the streams & Hillsdale Lake	Liquid from leaking containers a possible environmental concern
Air contamination from containers	Leaking containers could contaminate the air.	Gas from leaking containers a possible environmental concern
Noise near residential homes	Noise could impact the residential neighborhoods	Noise could affect neighbors
Diesel truck air pollution	Diesel truck and engine fumes would add additional air pollution	Fumes detracts from air quality
Quality of life reduction	Community concern about damage to quality of life, especially related to noise, air and water quality, and traffic.	Potential to have adverse impact on general quality of life
Construction dust	Dust during construction of Intermodal and Logistics facilities	Dust could impact neighbors
City Services (non-utility)		
Damage to road surface from truck traffic	Road surfaces would not hold up to truck traffic & require major repairs & replacement	Current road infrastructure in area unable to handle truck traffic & weight
Edgerton road maintenance	Possible impact to the Edgerton portion of 56 Highway without revenues for street improvements, & impact on regional road system.	No funding stream available for Edgerton to improve streets
Crime increases	Public Safety potentially inundated by crime related to facility	Increase in public safety calls
Inability to control truck traffic	Public Safety could experience difficulties in controlling truck traffic	Enforcement of truck routes difficult
Fire suppression for warehousing	Fire suppression difficult to handle for extremely large facilities	Increase in need for fire suppression
Hazmat response	Ability of city to respond to major hazmat situations	Increase in hazmat response calls
False emergency alarms	Increased alarm and false-alarm responses	Increase in alarm responses
City's construction oversight expertise	City's ability to provide necessary construction time expertise and oversight	Additional project oversight required
City Services (Electric)		
Cost to buyout KCPL	City would incur costs to acquire service area from KCPL	Costs to acquire KCPL service area
Increased system maintenance costs	Increased system maintenance represents a future cost for the City	Increased system maint. costs
Cost to purchase additional capacity	Cost increases to purchase additional capacity would be required	Costs to buy system capacity
City Services (Water)		
Water pressure for fire suppression	Inability to fight fires if proper pressure for fire flow cannot be achieved.	Water pressure/fire flow improvements may be required
City Services (Wastewater)		
NA		

Source: City of Gardner, KS

Table A5: Issues Associated with Proposed Intermodal and Logistics Park – Recommendations

Recommendation Category	Description
Economic Development	
Use incentives wisely	Use incentives carefully to maximize revenue - some incentives may be necessary to compete with other local governments
Require infrastructure standards	Require infrastructure be constructed to the highest standards w/ regular maintenance to lessen major rehabilitation.
Find other investors	Leverage federal, state and private funding to minimize city investment
Require impact fees	Continue use of impact fees for water, wastewater, parks, and streets - new development should pay for impacts to system.
Set utility rates	Utility rates paid by the facility will pay for maintaining the system.
Development pays for infrastructure	The new development must pay for the infrastructure improvements required for this project.
Conduct cost/benefit analysis	City should begin a time-based cost/benefit analysis of the project
Review incentive policies	City should review& update incentive policies prior to approving development & annexation agreements
Transportation	
New interchange required	New interchange completed prior to opening Intermodal facilities, directing traffic away from Gardner Road interchange.
Intermodal Truck Traffic Restricted	Trucks using I-35 should be required to enter and exit using only the new interchange
183rd Street	183rd Street west of Center must be closed to trucks but available for auto use by employees to avoid residential areas.
Traffic standards for trucks	Traffic standards in place to direct trucks to appropriate roads, I-35 or 56 Hwy, restricting trucks from residential/ high traffic areas.
Overpass on Waverly & 199th	Overpasses improved on Waverly Rd. & 199th Street; other upgrades to at-grade crossings in Gardner/Edgerton; all completed prior to facilities opening
Waverly Road Improvements	Waverly Road improved to four-lanes south of 56 Hwy; intersection at 56 Hwy & Waverly realigned prior to opening
183rd and 191st Streets	183rd and 191st Streets should be constructed to handle employee traffic for the facilities.
Intermodal entrance at 191st and Four Corners Road	The truck entrance should be located near 191st & Four Corners Road; must be designed and constructed to handle projected traffic at build out, and to be constructed to standards to minimize road failures and provide ease of maintenance.
Long-term improvements plan for area	Work with Johnson County, MARC, KDOT, & FHWA to plan long-term improvements required for development in area
Devise plans to control traffic	Identify ways to control directional traffic restrictions onto 56 Hwy & designated truck routes.
Highway watch program	Initiate truck based hwy watch to leverage presence of trucks into added security net for motorists & strengthen cargo inspections
Access to cemetery	Obtain agreement from developer for public access to cemetery
Relocate weigh station	Work with State to relocate weigh station southwest on I-35
Parking on streets	Restrict and prohibit overnight parking on streets and roads coming in or out of the facility
Restrict trailer length	Develop State legislative program to maintain current state regulations restricting number of pull behind trailers to two on I-35
Study improvements to Waverly Rd. intersection with 56 Hwy.	Evaluate impact and identify appropriate improvements to Waverly Road and 56 Hwy. intersection, including signalization and geometric intersection improvements.
Study 56 Hwy. intersection improvements	Examine improvements to 56 Hwy. westbound; including base improvements for increased vehicular weight, widening or expansion of roadway.
Construction related traffic	City or develop plans to deal with construction traffic related to the Intermodal and Logistics facilities
Land Use	
Impact of industrial uses	The Intermodal facility to be designed, built and landscaped with berms & plantings to reduce visibility of high industrial uses (cranes, container storage, etc.)
Loading docks	Warehouses, especially along the east edge of Waverly, aligned so that loading docks do not face housing.

Recommendation Category	Description
Buffers for Intermodal facility	Warehouses built to serve as buffer between Intermodal facility and the surrounding areas.
Building design	Buildings should be high quality, low profile, tilt up construction, with white or similar earth tone coloring, utilizing high quality and attractive design standards.
Use of landscaping	An abundance of landscaping should be used and maintained to block visibility, muffle sounds, and create an attractive, aesthetically pleasing look.
Electric cranes	Cranes should be electric to minimize noise & work area lighting.
Facility lighting	Lighting should be as low to the ground as possible to minimize spillage beyond Intermodal facility. Lights directed down with proper shades.
Noise	Establish a process to determine noise impact on adjacent neighborhoods & develop controls to abate impact.
Open space	Require appropriate buffer, ground and open space integrated into any plan for development
Cranes for work site lighting	New cranes should have downward focused lighting to eliminate or reduce nighttime light spray
Night sky ordinance	Enact night sky ordinance for this and similar developments
Planned unit zoning	Planned Unit Zoning district should be required; not general zoning districts
Batch plant	City staff to work with railroad to locate batch plant, if required for facility construction, on property owned by BNSF in location to minimize potential impact on adjacent properties
Environment	
Environmental regulation and standards compliance	Project required to meet all federal, state and local regulations. Work with Hillsdale Water Quality, KDHE, MARC, Blue Skyway Coalition and others to minimize impacts of pollution.
Air quality modeling	Utilize MARC to help conduct air quality modeling services, prior to project development
Testing stormwater runoff	State of the art detention ponds & holding facilities should be constructed to keep runoff to pre-construction levels; provide areas to treat or reduce pollutants in runoff utilizing independent lab to conduct tests & provide results to City.
Containment facilities & procedures for cargo	Appropriate containment facilities & procedures should be developed to handle potential for leaking cargo
Containment facilities & procedures for fuel/chemicals	Appropriate containment facilities and procedures should be developed for any on-site fuel or chemical storage
Interchange for facility	A new interchange and road system must be constructed to bring in trucks quickly & divert away from residential areas.
Noise buffers	Berms, landscaping, buildings and open space must be constructed as noise buffers
Lighting	Light poles should be installed low to the ground, and with state-of-art directional shades to minimize the nighttime glow of the facility. The number of lights should be kept to a minimum and only in areas as required for safety.
Night sky ordinance	Night sky ordinance should be implemented.
New environmental technologies	Apply best new environmental technologies & practices to entire development site, i.e. use of alternate fuels & green buildings
Approve jake brake and related ordinances	Pass an ordinance to control jake braking and related braking noises
Require lower emission vehicles	Investigate lower emission options of locomotives
Approve idling ordinance	Consider idling ordinance for locomotives and diesel trucks
Landscaping & air quality	Utilize landscaping & open spaces as way to clean & mitigate air quality concerns, i.e. types of trees clean air better than others
Dust mitigation	Develop dust mitigation policies for construction phase of the Intermodal & Logistics facilities & similar developments

Recommendation Category	Description
City Services (non-utility)	
Road surface standards	Require pavement design to meet standards for the anticipated truck volume & weight; consider construction of concrete streets designed for heavy truck traffic.
Designate truck routes	Designate truck routes to control truck traffic.
Traffic calming	Provide traffic calming measures where appropriate & possible to control truck traffic from using non-designated routes.
Public Safety Equipment	Purchase required equipment to service the facility for Public Safety needs, (e.g. an aerial fire truck that is currently unfunded.)
Fire suppression needs	If necessary, developer required to provide for fire suppression capacity onsite, or provide for city-wide capacity enhancement.
Fire stations	Continue with current plans to build fire stations at 183rd east of Center and at 167th & Kill Creek.
New alarm response ordinance	Consider fee based alarm response ordinance that charges for false alarms
Area roadway & infrastructure issues	Review possible regional and or developer based solutions for addressing Edgerton 56 highway roadway infrastructure issues and regional impact on the road system
Mutual aid agreements	Make mutual aid response entities aware of development & coordinate training on facilities in future
Fire district detachment	Annexation process to be undertaken in way to minimize impact on other service providers, such as fire district detachment.
Public education campaign	City should undertake public education effort to advise community on proposal and begin healing process
Project manager during development	City should hire project manager to oversee construction of the site; assure the project adheres to the agreed upon standards for development & City's health and life safety regulations.
City Services (Electric)	
Additional capacity	Developer & facilities to pay for the needed additional capacity (either through placement of generators or through participation with other companies in major coal fired generation plants.)
2nd KCPL interconnect & 4th substation	The facilities/developer would pay for their portion of the second KCPL interconnect and fourth substation
Possible purchase of service area	The facilities/developer to pay for buyout of KCPL service area.
Infrastructure extensions	As with other developments, the facility/developer would pay for overhead & underground extensions, as required.
Determine whether City or KCPL should provide electric	If not advantageous to city's current & future customers to provide electricity, City to consider KCPL to provide service to area & City receives 5% revenue from franchise fees paid by KCPL.
Transmission lines relocated	KCPL transmission lines to be relocated at BNSF's expense
Address environmental impacts with MARC & KDHE	Environmental issues should be addressed in coordinated fashion with MARC & KDHE
Cost/benefit analysis on electric utility	Cost/Benefit analysis needs to be conducted by an electric utilities expert to determine best options
City Services (Water)	
Water pressure/fire flow	Verify capacity/pressure required for adequate fire flow; developer to provide for water towers or other measures to ensure the pressure for fighting fires is adequate before opening of facilities
City Services (Wastewater)	
Wastewater service	BNSF to work with County and City to study sanitary sewer options for area; account for future potential development within watershed, and also along I-35 in area of new interchange.
Development pays for improvements	As with other developments, the developer would pay for necessary infrastructure improvements.

Source: City of Gardner, KS

Source: Kansas City International Airport

Figure A5: KCI Intermodal Site Plan

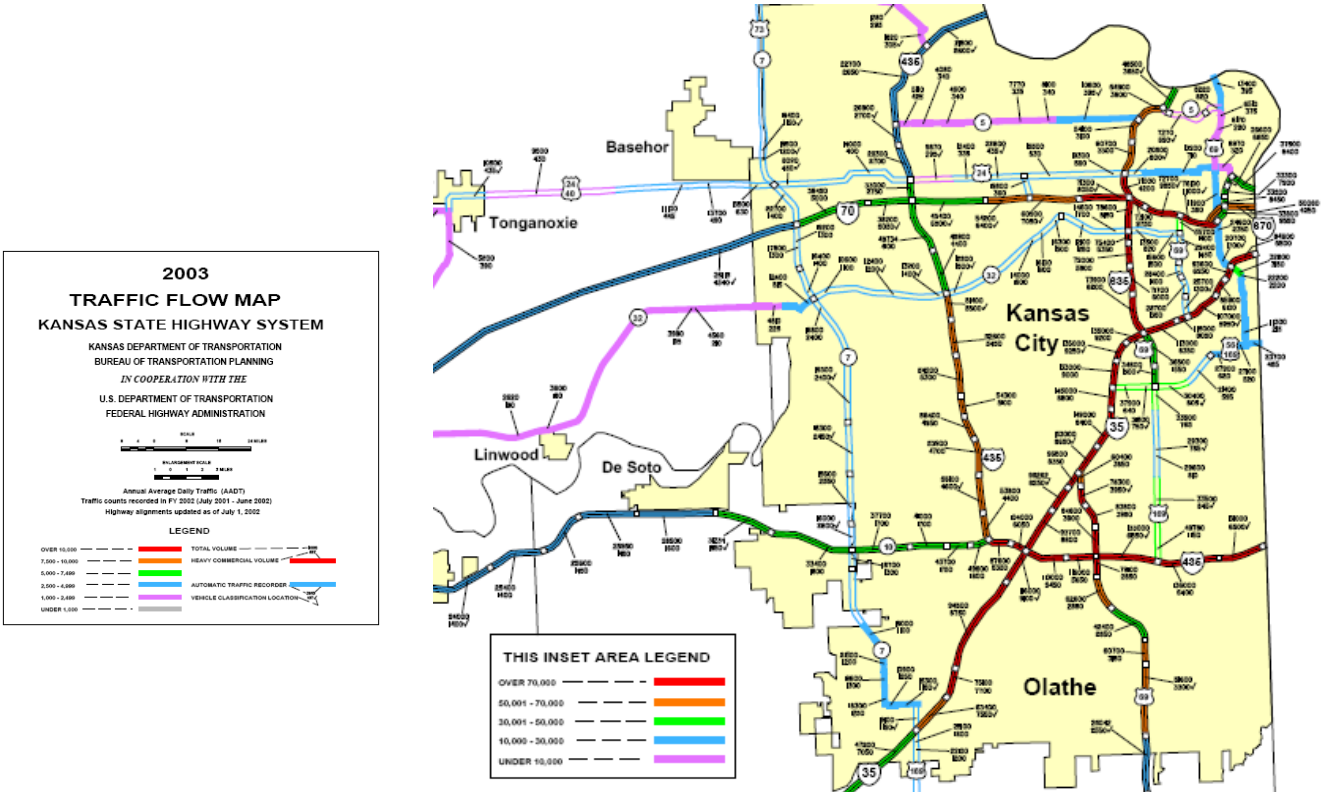


Figure A6: Truck Data for Kansas City, Kansas from KDOT for 2002

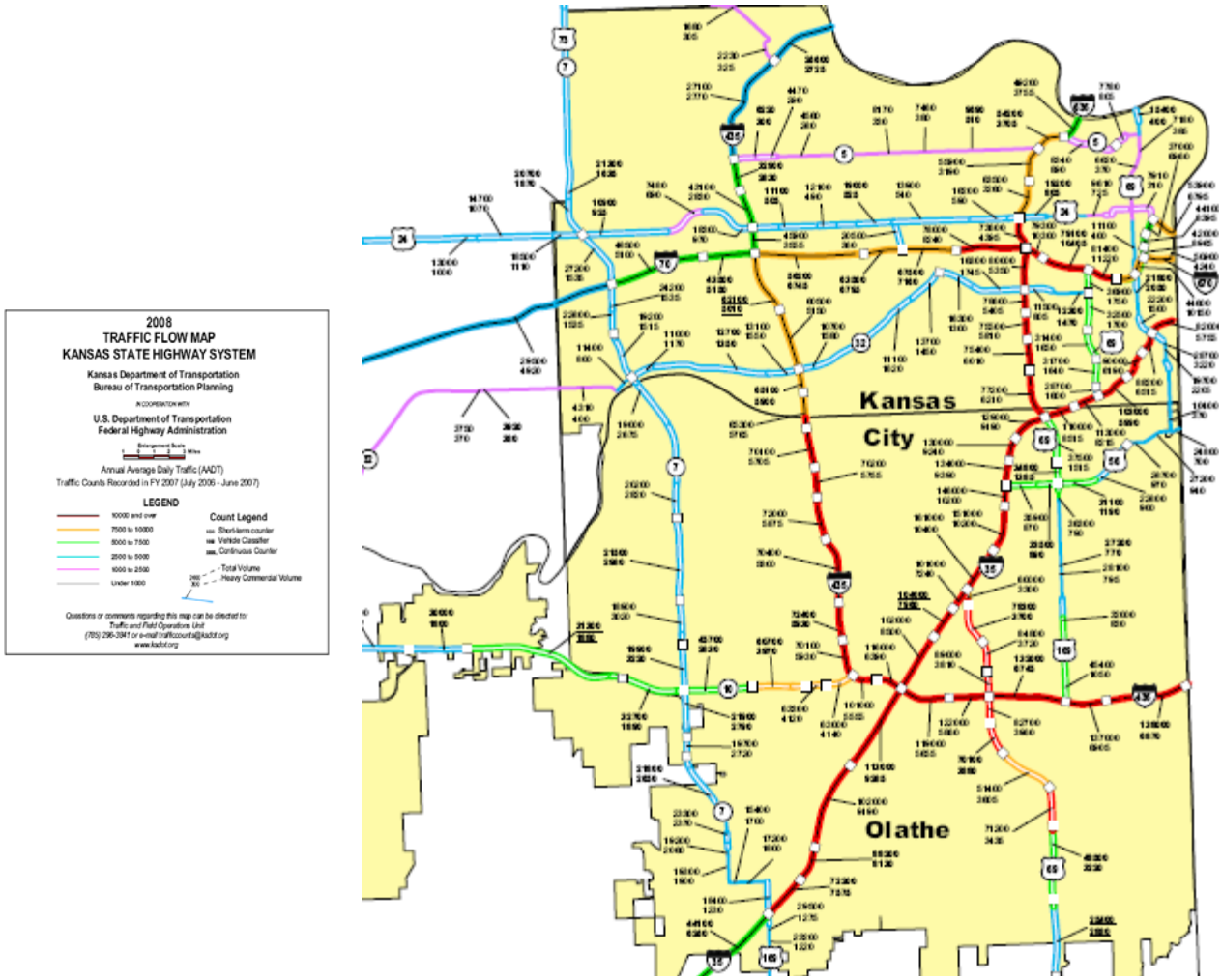


Figure A7: Truck Data for Kansas City, Kansas from KDOT for 2007

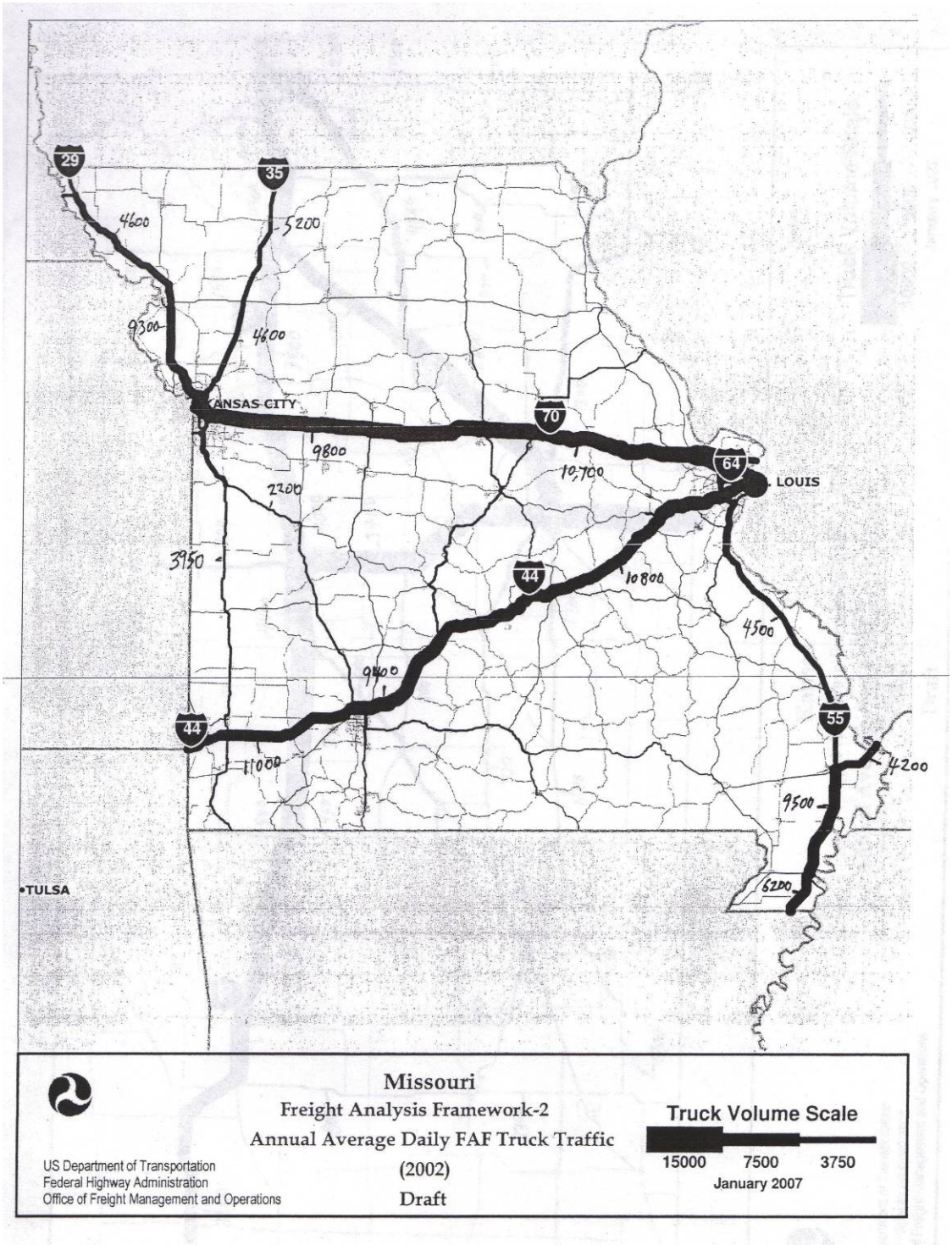


Figure A8: Truck Data for Missouri

Table A6: 2002 Shipments from Kansas City Metropolitan Area by Commodity

Commodity	2002 Ktons From KC
Alcoholic beverages	817
Animal feed	4,319
Articles-base metal	1,665
Base metals	958
Basic chemicals	2,326
Building stone	81
Cereal grains	40,601
Chemical prods.	2,189
Coal	522
Coal-n.e.c.	25,493
Crude petroleum	944
Electronics	840
Fertilizers	1,474
Fuel oils	1,989
Furniture	313
Gasoline	3,021
Gravel	15,572
Live animals/fish	2,348
Logs	173
Machinery	1,303
Meat/seafood	691
Metallic ores	9
Milled grain prods.	3,162
Misc. mfg. prods.	707
Mixed freight	3,750
Motorized vehicles	2,482
Natural sands	333
Newsprint/paper	132
Nonmetal min. prods.	9,550
Nonmetallic minerals	172
Other ag prods.	4,790
Other foodstuffs	4,857
Paper articles	860
Pharmaceuticals	210
Plastics/rubber	901
Precision instruments	295
Printed prods.	751
Textiles/leather	283
Tobacco prods.	13
Transport equip.	1,176
Unknown	3,665
Waste/scrap	9,202
Wood prods.	1,623
Total	**156,561**

**Includes only shipments by Truck, Truck & Rail, Air & Truck*

Table A7: 2002 Shipments to Kansas City Metropolitan Area by Commodity

Commodity	2002 Ktons To KC
Alcoholic beverages	876
Animal feed	3,774
Articles-base metal	1,678
Base metals	2,712
Basic chemicals	1,834
Building stone	105
Cereal grains	29,395
Chemical prods.	1,804
Coal	14,640
Coal-n.e.c.	33,234
Crude petroleum	1
Electronics	593
Fertilizers	2,197
Fuel oils	2,428
Furniture	405
Gasoline	3,439
Gravel	17,106
Live animals/fish	2,055
Logs	327
Machinery	1,877
Meat/seafood	1,013
Metallic ores	15
Milled grain prods.	1,491
Misc. mfg. prods.	715
Mixed freight	3,465
Motorized vehicles	2,297
Natural sands	789
Newsprint/paper	1,279
Nonmetal min. prods.	8,401
Nonmetallic minerals	795
Other ag prods.	5,152
Other foodstuffs	4,611
Paper articles	706
Pharmaceuticals	171
Plastics/rubber	1,080
Precision instruments	280
Printed prods.	490
Textiles/leather	464
Tobacco prods.	64
Transport equip.	953
Unknown	4,898
Waste/scrap	6,929
Wood prods.	3,223
Total	**169,760**

**Includes only shipments by Truck, Truck & Rail, Air & Truck*

Table A8: Commodities to Kansas City Metropolitan Area by Value in 2002

Commodity	2002 Value To KC
Alcoholic beverages	900
Animal feed	610
Articles-base metal	3,151
Base metals	2,187
Basic chemicals	754
Building stone	19
Cereal grains	1,978
Chemical prods.	3,282
Coal	163
Coal-n.e.c.	10,736
Crude petroleum	0.119
Electronics	6,381
Fertilizers	252
Fuel oils	733
Furniture	1,877
Gasoline	1,176
Gravel	96
Live animals/fish	2,383
Logs	45
Machinery	12,537
Meat/seafood	1,858
Metallic ores	32
Milled grain prods.	1,950
Misc. mfg. prods.	4,828
Mixed freight	9,541
Motorized vehicles	12,267
Natural sands	9
Newsprint/paper	798
Nonmetal min. prods.	1,221
Nonmetallic minerals	103
Other ag prods.	1,766
Other foodstuffs	4,287
Paper articles	877
Pharmaceuticals	7,320
Plastics/rubber	2,678
Precision instruments	2,149
Printed prods.	2,136
Textiles/leather	4,898
Tobacco prods.	408
Transport equip.	1,655
Unknown	4,063
Waste/scrap	704
Wood prods.	1,236
Total	**116,044**

**Includes only shipments by Truck, Truck & Rail, Air & Truck*

Table A9: Commodities from Kansas City Metropolitan Area by Value in 2002

Commodity	2002 Value From KC
Alcoholic beverages	920
Animal feed	667
Articles-base metal	2732.77
Base metals	1,103
Basic chemicals	536
Building stone	13
Cereal grains	2,917
Chemical prods.	2,729
Coal	52
Coal-n.e.c.	7,836
Crude petroleum	94
Electronics	4,607
Fertilizers	76
Fuel oils	599
Furniture	1,461
Gasoline	1,096
Gravel	78
Live animals/fish	2,724
Logs	13
Machinery	8,598
Meat/seafood	1,298
Metallic ores	20
Milled grain prods.	5,408
Misc. mfg. prods.	6,982
Mixed freight	14,834
Motorized vehicles	21,818
Natural sands	2
Newsprint/paper	142
Nonmetal min. prods.	1,292
Nonmetallic minerals	8
Other ag prods.	1,732
Other foodstuffs	4,284
Paper articles	1,263
Pharmaceuticals	5,543
Plastics/rubber	2,287
Precision instruments	461
Printed prods.	3,816
Textiles/leather	2,501
Tobacco prods.	229
Transport equip.	1,382
Unknown	3,210
Waste/scrap	1,408
Wood prods.	803
Total	**119,573**

**Includes only shipments by Truck, Truck & Rail, Air & Truck*

Table A10: 2007 Shipments from Kansas City Metropolitan Area by Commodity

Commodity	2007 Ktons From KC
Alcoholic beverages	892
Animal feed	3,879
Articles-base metal	1,801
Base metals	1,218
Basic chemicals	2,438
Building stone	106
Cereal grains	35,485
Chemical prods.	2,485
Coal	650
Coal-n.e.c.	1,265
Crude petroleum	8
Electronics	816
Fertilizers	1,652
Fuel oils	2,396
Furniture	344
Gasoline	3,687
Gravel	17,917
Live animals/fish	2,431
Logs	532
Machinery	1,468
Meat/seafood	739
Metallic ores	16
Milled grain prods.	2,854
Misc. mfg. prods.	686
Mixed freight	3,863
Motorized vehicles	961
Natural sands	933
Newsprint/paper	131
Nonmetal min. prods.	10,367
Nonmetallic minerals	305
Other ag prods.	4,473
Other foodstuffs	4,288
Paper articles	931
Pharmaceuticals	209
Plastics/rubber	975
Precision instruments	308
Printed prods.	703
Textiles/leather	293
Tobacco prods.	17
Transport equip.	1,149
Unknown	3,942
Waste/scrap	7,283
Wood prods.	1,834
Total	**128,729.6**

**Includes only shipments by Truck, Truck & Rail, Air & Truck*

Table A11: 2007 Commodity Shipments to Kansas City Metropolitan Area by Ktons

Commodity	2007 Ktons To KC
Alcoholic beverages	902
Animal feed	3733
Articles-base metal	1779
Base metals	3151
Basic chemicals	1558
Building stone	129
Cereal grains	27653
Chemical prods.	1997
Coal	657
Coal-n.e.c.	1871
Crude petroleum	9
Electronics	595
Fertilizers	2145
Fuel oils	2832
Furniture	439
Gasoline	3958
Gravel	19394
Live animals/fish	2137
Logs	628
Machinery	2015
Meat/seafood	1087
Metallic ores	22
Milled grain prods.	1555
Misc. mfg. prods.	722
Mixed freight	3620
Motorized vehicles	1709
Natural sands	1272
Newsprint/paper	830
Nonmetal min. prods.	8958
Nonmetallic minerals	869
Other ag prods.	4512
Other foodstuffs	4541
Paper articles	780
Pharmaceuticals	177
Plastics/rubber	978
Precision instruments	289
Printed prods.	506
Textiles/leather	442
Tobacco prods.	67
Transport equip.	821
Unknown	4954
Waste/scrap	7609
Wood prods.	2832
Total	**126,733.6**

**Includes only shipments by Truck, Truck & Rail, Air & Truck*

Table A12: Commodities to Kansas City Metropolitan Area by Value in 2007

Commodity	2007 Value To KC
Alcoholic beverages	984
Animal feed	612
Articles-base metal	3,049
Base metals	2,406
Basic chemicals	582
Building stone	22
Cereal grains	1,798
Chemical prods.	3,658
Coal	55
Coal-n.e.c.	977
Crude petroleum	1
Electronics	4,730
Fertilizers	233
Fuel oils	**822**
Furniture	1,968
Gasoline	1,254
Gravel	111
Live animals/fish	2,475
Logs	34
Machinery	13,146
Meat/seafood	2,014
Metallic ores	40
Milled grain prods.	2,052
Misc. mfg. prods.	3,809
Mixed freight	9,871
Motorized vehicles	8,483
Natural sands	11
Newsprint/paper	603
Nonmetal min. prods.	1,300
Nonmetallic minerals	106
Other ag prods.	1,736
Other foodstuffs	4,491
Paper articles	959
Pharmaceuticals	5,962
Plastics/rubber	2,610
Precision instruments	1,319
Printed prods.	1,883
Textiles/leather	4,181
Tobacco prods.	467
Transport equip.	1,750
Unknown	4,299
Waste/scrap	774
Wood prods.	1,226
Total	**98,860**

**Includes only shipments by Truck, Truck & Rail, Air & Truck*

Table A13: Commodities from Kansas City Metropolitan Area by Value in 2007

Commodity	2007 Value From KC
Alcoholic beverages	714
Animal feed	518
Articles-base metal	2,248
Base metals	1,962
Basic chemicals	536
Building stone	17
Cereal grains	2,495
Chemical prods.	2,740
Coal	4
Coal-n.e.c.	1,535
Crude petroleum	1
Electronics	3,599
Fertilizers	321
Fuel oils	540
Furniture	2,368
Gasoline	962
Gravel	78
Live animals/fish	2,248
Logs	33
Machinery	11,648
Meat/seafood	1,535
Metallic ores	32
Milled grain prods.	2,398
Misc. mfg. prods.	2,967
Mixed freight	7,496
Motorized vehicles	5,408
Natural sands	14
Newsprint/paper	540
Nonmetal min. prods.	969
Nonmetallic minerals	24
Other ag prods.	1,293
Other foodstuffs	3,212
Paper articles	789
Pharmaceuticals	4,777
Plastics/rubber	1,818
Precision instruments	1,655
Printed prods.	1,866
Textiles/leather	4,553
Tobacco prods.	498
Transport equip.	1,932
Unknown	4,217
Waste/scrap	754
Wood prods.	1,176
Total	**84,489**

**Includes only shipments by Truck, Truck & Rail, Air & Truck*

APPENDIX B - MEETING MINUTES

Date: Sept. 4, 2007
Time: 9 a.m.
Location: KDOT- Topeka, KS
KU Attendants: Dr. Yong Bai, Erin Wurfel, Sasha Skiba, Luke Huan and Pat Oslund
KDOT Attendants: John Maddox, John Rosacker, David Schwartz, Eddie Dawson and Alan Spicer

The goal of the meeting is to get to know each other and become familiar with the Freight Analysis Framework project. We are still researching what types of data to use for the database. Erin will research and collect data with the help of Sasha and Pat. Luke Huan and a computer science graduate student will setup the database and user interface for the KFAF. We hope that the KFAF can be applied to other cities in Kansas, such as Wichita.

The immediate goal is to get help from KDOT and MDOT, gather information and data, make contacts with others such as Mid-America Regional Council. Working with MODOT needs to be a priority.

According to John Maddox, KDOT is launching a major freight study soon with MARC. It will be used as a marketing mechanism as well. The contact with MARC for the freight study is Darryl Fields. Wichita is launching a freight study soon but we do not know specific details. Mike Moriarty of Wichita Metropolitan Planning Organization is the contact. Third Party Logistic Providers (3PLS) can give insight on how shipments work; getting freight moved from A to B in the fastest and cheapest way.

Kansas City International Airport will be expanding its freight facility. Not sure when this will occur. Kansas only sees the truck portion of the freight movement.

Indianapolis, Nashville and Kansas City are becoming big freight hubs. There is a trend to using smaller warehouses in multiple cities. Kansas City is filling the same niche as Indianapolis, Lexington etc. Demand for traffic is estimated using linear growth models Warehouses are just places to transfer goods not to store goods.

The Gardner, KS hub will be truck to truck movement. 75% of traffic passes through KS. 70% of rail traffic pass through KS. 60% of truck traffic passes through Kansas. You can think of K.C. as a bathtub and KS as the drain.

The CTIP Study (Cross-town Improvement Program) looks at local truck moves. KC is a test bed for a federal study that is going on.

John Rosacker says truckers are like water, they follow the path to the lease resistance. Time is money.

Information sources might include Reebie Cambridge Systematics for truck data and Waybill Reports for rail info. UP and BNSF are the big railroad companies in Kansas.

Trucking companies are very protective with their date. KDOT members refer to it is a “the wall of silence.”

MARC with the support of MODOT and KDOT is doing an external station survey. They will photograph license plates on cars entering and leaving Kansas. Sometimes they will stop traffic and ask where the car is coming from and going. Then surveys will be sent to those car owners with a survey to fill out. This study will focus on all traffic.

KDOT typically uses the Access Database to organize information. HPMS Data set from FHWA is a good source. DASK is a network at KU with GIS data on all the KS roads.

KC Scout Data is KDOT’s IT system (cameras on 435 and I 35). There are sensors in the pavement that measure traffic flow and speed. This info feeds to the signs above the highways to post approximate time to a destination.

LRTP (Long Range Transportation Plan) is currently being updated and might be released late this year. There is also a section on freight.

The time frame of the project is 16 months and to be finished December 2008.

Date: Sept. 14, 2007
Time: 10 a.m.
Location: Smartport Kansas City, MO
KU Attendants: Dr. Yong Bai, Erin Wurfel, Sasha Skiba, Luke Huan and Pat Oslund
Smartport Attendants: Chris Gutierrez, president of Smartport

Everyone introduces themselves and Dr. Bai describes the FAF project. He says we are to identify major highways, potential problems; railroad business has a great impact on highways.

Chris Gutierrez suggests talking to Gary Bartek, the cargo manager at MCI. He gives an overview of Smartport. Smartport is a non-profit corporation that covers the Kansas City metro area – a 90 mi radius and 18 counties. The goal is to grow the transportation logistics industry through economic development activies. Smartport was formed from the NAFTA Mid-Continent Tradeway Study of 1995. This was done by TransSystems. The study also found that a new bridge needed to be built in Missouri. Chris' job includes three key things:

1. Promote the region for manufacture and distribution centers. This creates tax base, jobs and puts money into the economy. Current projects include Pacific Sunwear and Kimberley Clark distribution centers.
2. Focus on technology such as Trade Data Exchange (TDE)-visibility portal that tracks freight. UPS has this service but is it secure?
3. Work on the umbrella of railroad and highway. Make sure these modes are growing. The smartport website has contacts for these modes.

Currently, Smartport has received $1/2 million for a new 12 month freight flow study. Smartport is not in contract with TransSystems yet, probably will be the first of Nov 2007. It will look all of the transportation modes in and out of the KC. Do a comparison to other cities (Minneapolis), also do a projection. They will purchase the data that Smartport will use. We can meet with Mark Keneeley or Sarah from TransSystems. They also did a Mexican Customs Facility Study (N/S trade study). Other areas for data can include focus groups, ETC, a data gatherer in Indianapolis, and Jane Mogley and Associates in Kansas City. Chris also has contacts with trucking, manufacturing and distribution contacts.

MODOT just did a new statewide freight flow study a year ago. The future of freight is international. BNSF does 400,000 lifts.

KC U.S. Customs at point of entry clears $9 billion/ year of freight. KC Southern Railroad brings trade North to South (Canada to Mexico).

Kansas City competes for distribution centers with Memphis, Indianapolis, Nashville and Oklahoma City. MCI is the largest air center in the 6 state region.

Trans Texas Corridor project deals with I-35 being at capacity. Private company wanted to build it and toll it to pay for it. Trucking companies like tolls because they use the roads the most and want better roads. So they don't mind paying for it.

Every U.S. port saw double last year. Shangiia, China is the biggest port in the world. They took 3 islands and leveled them for the port. Then a 30 mi bridge was created to connect the new city.

Date: Oct. 12, 2007
Time: 12 p.m.
Erin Wurfel, KU
Tianjia Tang, FHWA

FAF does two things:

1. Tonnage and dollar amount commodities from one place to another.
2. Help to answer the number of trucks carrying those goods. Determine congestion level on highways.

Other states are developing their own FAF.

Classification System for freight:
-Fed uses SCTG which is the standard classification for transported goods. There are 42 categories and 43 commodities.
-RBU
-NU

The Flow Process of Constructing FAF:
What freight?
Figure out freight classification?
How do you measure? Dollar value and weight (tonnage)
What mode? Truck (highway), rail, air, water
How many trucks do you need to transport goods?
How much does each truck carry? – figure out vehicle carrying capacity
Which highway? Which route do you take?
How many lanes does the highway have?
How much congestion?
How do the trucks impact the roads?

FHWA used the 2002 Commodity Flow Survey for most of the statistics but it's not complete. So they also collected other data.

Global Inside is the contractor that did the future projection.

Other ways to do FAF: Other states find out the number of trucks for traffic projections.

Railroads are privately owned but they have good data which doesn't need to be manipulated.

Date: Jan. 22, 2008
Time: 10 a.m.
Location: KDOT- Topeka, KS
KU Attendants: Dr. Yong Bai, Erin Wurfel, and Luke Huan
KDOT Attendants: John Maddox, John Rosacker, David Schwartz, Alan Spicer, and Joel Skelley

The purpose of this meeting was to share the progress report of the project. The literature review is mostly complete. It just needs some polishing.

John Maddox speaks of the Statewide Commodity Flow is producing lots of reports.

Dr. Bai explains the progress report.
In regards to the database, commodity data will have function to take data and update it. It will let you project the future.

John Rosacker has concerns with how the Gardner Intermodal facility will affect the other railroads: Union Pacific, Norfolk Southern and Richard Gabour/KC Southern. Union Pacific has intermodal facilities in KC, KS and KC, MO.

Kstate campus is expanding southeast of K-10 and K-7.

Contact Bob Perry for information on New Century Air Center.

Chris Guitterez with SmartPort for detailed information…Regional Freight Report with transsytems and MARC.
Ron Alchepol, MARC and Darryl Fields good contacts.

Another KDOT concern is the truck traffic between warehouse and intermodal facility. There are warehouses all over Kansas City area and a new one near 135th Street in Olathe.

May need to change kilometers to miles in lit review.

Database needs flexibility with projections...maybe variance and confidence intervals.

Integration between tables and GIS?
What are the number of links? David says possibly twenty links. FED prolly has 100 links.

It is important that the data be more accurate.
Alan has truck data and number of trucks going in and out of KC. This can be the baseline for seeing if data is accurate.
FAF underestimates KS truck traffic. This concerns KDOT that the use of FHWA FAF may control how much money KDOT received from the federal government.

K-TRAN

KANSAS TRANSPORTATION RESEARCH
AND
NEW - DEVELOPMENTS PROGRAM

A COOPERATIVE TRANSPORTATION RESEARCH PROGRAM BETWEEN:

KANSAS DEPARTMENT OF TRANSPORTATION

THE UNIVERSITY OF KANSAS

KANSAS STATE UNIVERSITY